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DESIGN
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DECEMBER ★ 1945

INDUSTRIAL
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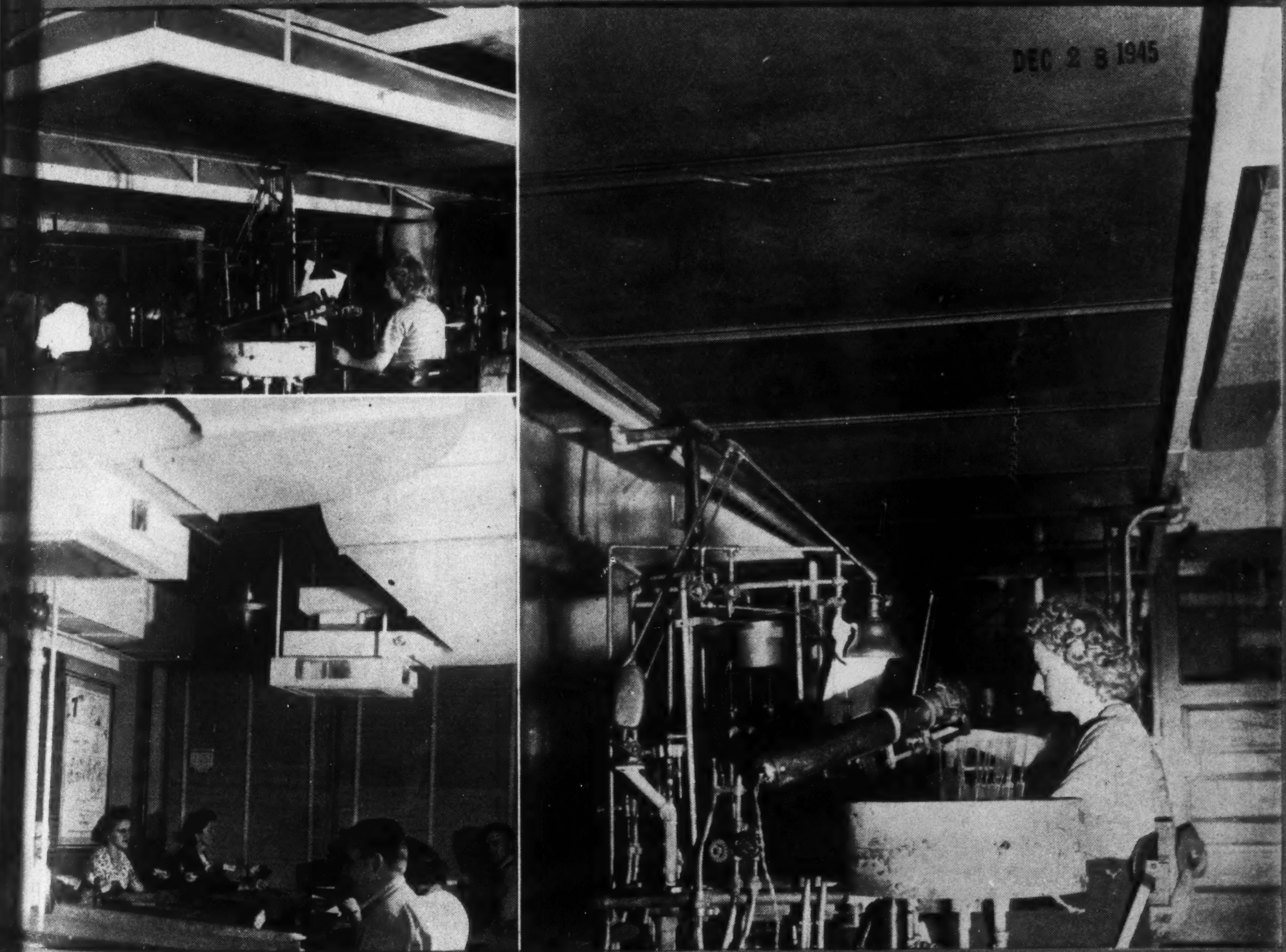
33 — *Journal Section of the American Society of Heating and Ventilating Engineers*

DEC 28 1945



*Control of the air in industry helps to win the battle of production!*

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# THE Editor's Pages

### AIR CONDITIONING NO. 1 ITEM FOR THEATERS

Complete air conditioning is the No. 1 item for theater owners planning the remodeling or building of new theaters, Mason Rapp, one of the nation's leading theater architects, told the Refrigeration Equipment Manufacturers Association.

The architectural firm of Rapp and Rapp, established in 1906, designed the Balaban and Katz and Warner Brothers theaters in Chicago and many others throughout the country. Now under contract to Warner Bros., the firm is planning extensive remodeling and building in cities and small towns in the middlewest. Actual work is expected to begin on many of these projects about the first of the year.

Mr. Rapp said that prior to the war only 12.5 per cent of the 18,000 theaters in operation were air conditioned, and many of these had "improvised systems which merely cooled the air."

### SCOPE OF ACRMA STANDARDS BROADENED

Extension of the coverage of ACRMA equipment standards, a broadening of the scope of the association's statistical activities, and the adoption of a public relations program basically planned to benefit all phases of the air conditioning and refrigeration industry, were highlights at the fall meetings of the Air Conditioning and Refrigerating Machinery Association and its board of directors held last month at Hershey, Pa.

D. W. Russell, president of the association and president of the Airtemp Div. of Chrysler Corp., said, following the meeting, that "the soundness of ACRMA's procedure in forming virtually autonomous product groups within the association has been amply demonstrated by the constructive accomplishments of the past 12 months. The several sections and their engineering committees have held a number of meetings, which in standardization alone have resulted in the revision of many ACRMA equipment standards and the formulation of new standards, while a great deal of progress has been made on other proposed standards."

Noteworthy among the new ACRMA standards are those covering "Freon-12" compressor and condensing units, open type and hermetic type, 25 to 200 hp, and open type "Freon-12" condensing units, air and water cooled, 20 hp and smaller. Many ACRMA standards on ammonia equipment were revised, as were the standards on room air conditioners and self-contained air conditioners other than the room air conditioner type. The ACRMA book of equipment standards is to be republished in revised and expanded form in 1946.

An expanded statistical program, under the direction of an experienced statistician, was also approved. The program will include the assembling of statistics of industry sales on a basis closely integrated with the activity now carried on by the Bureau of the Census. Reporting of sales of certain industry products by states is also included in the program.

The ACRMA board of directors, under the chairmanship of Charles E. Wilson, vice-president of the Worthington Pump and Machinery Corp., approved a public relations program "that promises to provide a constructive service for all segments of the industry and to meet a distinct need of the industry under peace-time conditions."

### '45 STOKER SALES SHOULD EXCEED 100,000

Factory sales of mechanical coal stokers for the first nine months of this year totaled 74,611 units of all sizes and types compared with 26,998 machines for the corresponding period in 1944 and 24,664 for the same months in 1943, as shown by a report released by the U. S. Department of Commerce based on figures supplied by manufacturers representing almost the entire production of stokers in the United States, according to the Committee of Ten—Coal & Heating Industries, Inc.

Production of stokers is showing a slight gain each month and sales for 1945, based on statistics available to date, should exceed a total of 100,000 units.

**READY SOON**

**An index to Heating, Piping & Air Conditioning for the year 1945 will be ready soon. If you want a copy, send a postcard to The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Illinois.**

### JOBBERS ASSOCIATION VOTES NAME CHANGE

At a meeting of its board of directors held recently in Chicago, the name of the National Refrigeration Supply Jobbers Association was changed to the Refrigeration Equipment Wholesalers Association in order to more fully describe the group and its functions.

The next general meeting for members of the REWA is planned for March 1946, and it is expected that the meeting will be held in Chicago in conjunction with the REMA group.

### CARL W. ZIES HEADS COMPANY

Carl W. Zies, recently elected president of the V. D. Anderson Co., has been with the company for 16 years; he came to the organization to take over the management of the steam specialties division and was later made general manager of all divisions.

A. D. Anderson is now chairman of the board.

### GEORGE O. BOOMER ELECTED PRESIDENT

George O. Boomer, longtime associate of the late Walter H. Girdler, Sr., founder of Tube Turns, Inc., has been elected president of the firm. He was vice-president of Tube Turns when Mr. Girdler died suddenly last January.

Mr. Boomer succeeded Rudy E. Fritsch, who resigned early in October. Mr. Fritsch will remain with Tube Turns as a consultant, for the present, according to an announcement from the company.

# THE Editor's Pages

## SFA DIRECTS DEALERS TO DISTRIBUTE COAL FAIRLY

The Solid Fuels Administration for War has issued a "direction" requiring retail dealers to distribute the available supply of coal, coke, and other solid fuels fairly among householders and other retail consumers in areas where such fuels now are scarce or may become short this winter.

In announcing issuance of the direction, Administrator Harold L. Ickes stated that there is no prospect that sufficient anthracite and high grade bituminous coals can be provided to give everyone his normal supply of these fuels between now and next spring. This situation, he said, is due to the lack of mine workers and to production losses caused by mine strikes.

## CONTROL MANUFACTURER PLANS EXPANSION

A $3,500,000 expansion program involving additions to plants and machinery in four United States and Canadian cities was announced November 26 by the Minneapolis-Honeywell Regulator Co. Needed to handle expanding sales in all company divisions, the new program follows purchase of a 10 story factory and the addition of four floors to the main plant during the war years, Harold W. Sweatt, president, said.

Included in the program is the construction of a new wing to the main plant in Minneapolis which will add approximately 120,000 sq ft of manufacturing space to current facilities. Company operations in Chicago, Toronto, and Philadelphia also will be enlarged either by the purchase of existing buildings or the addition of floor space to current structures. The building program will be started immediately, he said, while negotiations for the purchase of machinery to be housed in the new buildings has already begun.

Manufacturing more than 3000 different heating, ventilating, and air conditioning controls, the company recently announced a number of new products, among which are personalized heating controls for apartments, aeronautical control systems including an electronic automatic pilot and cabin temperature control system, and control systems for the railroad industry including journal box warning systems and diesel engine temperature controls.

"Our surveys and studies of future market possibilities indicate a growing demand for automatic control devices of all kinds," Mr. Sweatt said, and he pointed out that reconversion of all company plants was practically completed and that current production levels were approximately 30 per cent above previous peacetime peaks. The number of employees in all plants and divisions is now about double 1939 levels, he indicated, while employment peaks will rise considerably above current levels when the present expansion program is completed.

## MacCART NAMED PRESIDENT

At a meeting last month of the board of directors of the Petroleum Heat and Power Co., Kenneth G. MacCart was elected president, succeeding Wm. C. McTarnahan, who assumed the office of chairman of the board of directors. James D. Burnes, former assistant treasurer, was appointed treasurer and elected a member of the board of directors. Wm. A. Bulger, chief engineer of the company for over 15 years, was appointed vice-president in charge of manufacturing.

## CONSTRUCTION SHOWS SUBSTANTIAL GAINS

Substantial gains in construction contracts in October, probably attributable in part to the removal of all federal restrictions on building on October 15, have been reported for the 37 states east of the Rocky Mountains by F. W. Dodge Corp. The total of all contracts awarded during the month was $316,571,000, a gain of 13 per cent over September and 118 per cent over October of last year.

During the period October 16-31, immediately following removal of WPB limitation order 41, contracts totaled $175,771,000—compared with $71,556,000 in the corresponding period of 1944. For this comparative period nonresidential construction this year was up 216 per cent, residential building gained 172 per cent, and heavy engineering construction comprised of public works and utilities increased 36 per cent, a spokesman for the Dodge company revealed.

The construction volume for the first 10 months of the year aggregated $2,598,531,000, compared with $1,640,685,000 in the same period of last year. Construction for private accounts, as differentiated from publicly owned construction, represents 54 per cent of the total so far this year. During the first 10 months of last year, privately owned construction amounted to only 26 per cent of the total of all construction.

Residential construction in the first 10 months amounted to $388,959,000, a gain of 22 per cent over last year. Nonresidential building in the same period amounted to $1,449,185,000, an increase of 104 per cent over the corresponding period of 1944.

## FINED FOR MIS-USE OF A.C. PRIORITY

A steel company was fined a total of $148,000 last month on 37 counts on charges of diverting priorities assigned to a company owned hospital to a company owned country club, the Civilian Production Administration's compliance division has announced. The fine was imposed by a federal district court following a conviction obtained by the Department of Justice.

Apparent mis-uses of priority ratings by the steel company were uncovered by compliance investigators of the War Production Board (CPA's predecessor) in December 1944 in the course of a routine investigation of another company. Further checking indicated apparent violations of WPB regulations in connection with the air conditioning and improvement of a country club used by company officials.

# Heating Piping & Air Conditioning

with which is merged the Aerologist

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Industrial, Commercial, Institutional,
and Public Buildings

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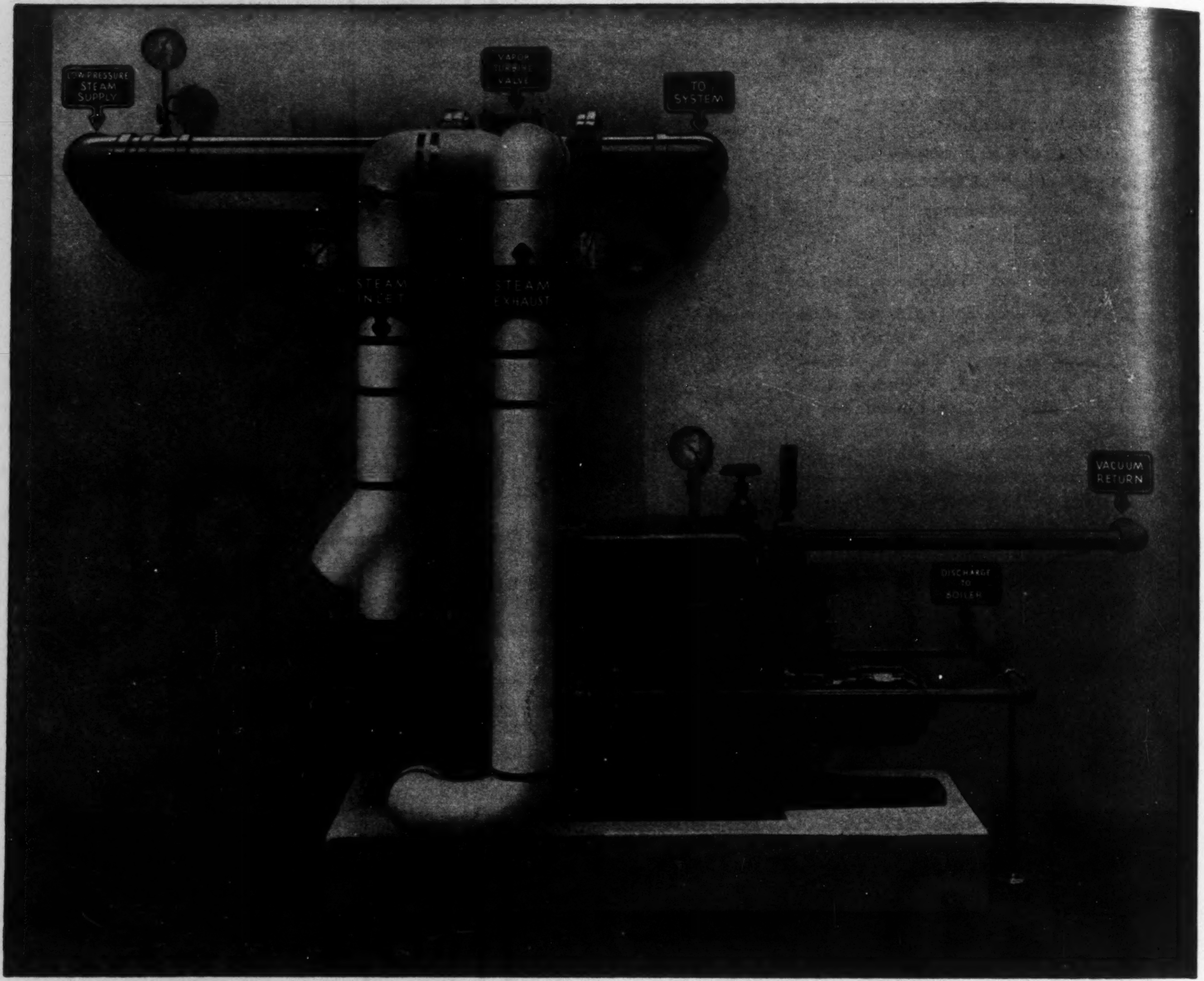
Interrupted Electric Service will not stop this NASH Heating Pump!



In Hospitals, Greenhouses, Schools, Public Buildings, Theatres, wherever heating systems must not fail, install the Nash Vapor Turbine, for it is independent of electric current failure, and continues to operate as long as there is steam in the system.

This is because the prime motive power of this economical pump is a special steam turbine, controlled by a unique "Vapor Turbine Valve", which automatically bypasses from the heating main a small portion of steam, the exact amount necessary to develop the power needed to remove the condensate and maintain the required vacuum on the system. Even this small amount is passed immediately back to the mains, and goes on to the system with little heat loss. This pump operates on any system, high or low pressure.

The Vapor Turbine is a most economical pump, for the elimination of electric current does away with current cost, the largest single item in the operation of an ordinary return line heating pump. Bulletin on request.

THE NASH ENGINEERING COMPANY
205-A WILSON ROAD, SOUTH NORWALK, CONNECTICUT, U. S. A.

# Air Diffusion and Distribution System Meets Requirements of Factory Process

**By E. E. Herbacek, Secretary and Chief Engineer**
**Spencer Air Conditioning Co.**

DESIGN OF THE air distribution system for a recent air conditioning installation made by the Spencer Air Conditioning Co. in one of the Minneapolis-Honeywell Regulator Co.'s plants presented a difficult problem due to the unusual requirements of critical manufacturing process control. The installation was made in the mercury switch department, occupying an entire floor of the main plant building. In this department, glass tubing is transformed into the various sealed mercury switches and contactors used in many types of temperature and electrical regulators. In this process, a multitude of finely adjusted gas flames are used by expert glass operators. It is essential that these flames not be disturbed by air movement, or the process cannot be carried on.

In addition to these individual flames, there are also three batteries of large, automatic gas flame operated, tubulator machines and annealing stoves. After being formed and calipered, the glass product is placed in electric annealing ovens which are located at each operator's station. Vacuum pump equipment, together with a battery of 1500 watt electric heaters, is used to produce the vacuum within the tube and introduce the mercury, after which the tube is sealed with small horseshoe gas flame sealers.

### Summertime Temperature Hit 120

Previous to the installation of air conditioning, temperatures in this space rose to as high as 120 F during summer months due to gas and electric heat dissipated within the department by the numerous process appliances. These abnormal conditions made it impossible for the operators to work fully clothed and many rest periods were required to allow periodic recuperation, which seriously affected production output of the department.

The company decided to expand this department, necessitating larger quarters on one of the upper floors of the building, and it was further decided to air condition completely and ventilate properly all operations of the process, in order to protect and safeguard the health and comfort of the operators.

The glass forming department, with all of its heat generating equipment, was partitioned to isolate it from the remainder of the manufacturing process. This required the department to be completely air conditioned for year around comfort of the operators and control of the process.

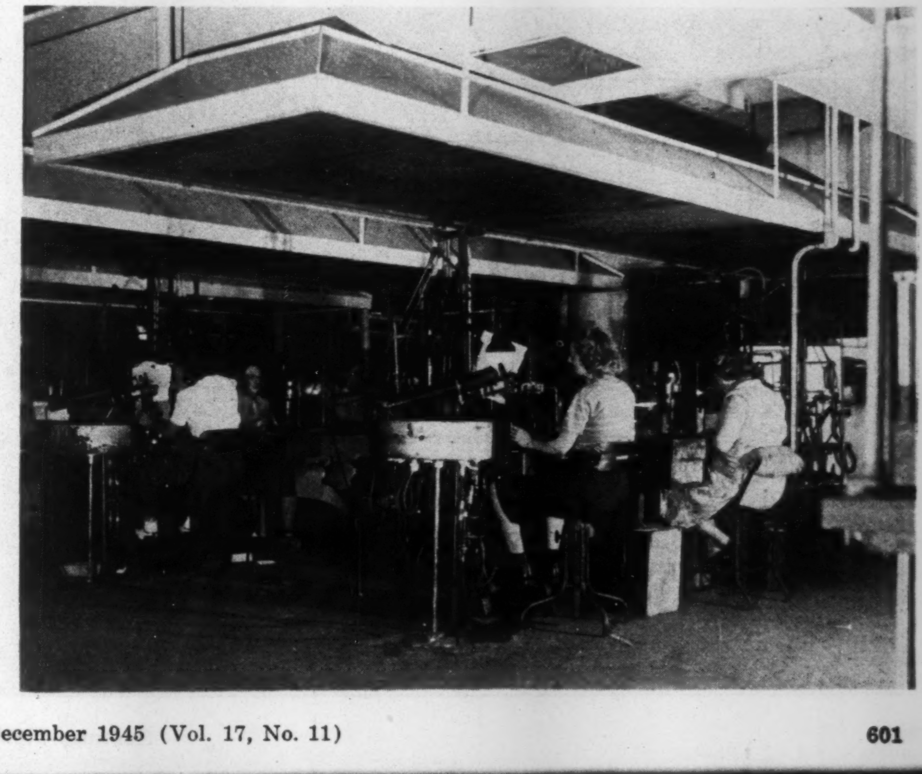
The estimated total heat load for this space, which was to be removed by the exhaust ventilation and air conditioning system, consisted of 411,200 Btu per hr total in gas flames, 290,000 Btu per hr total for electric heaters and ovens, and 23,000 Btu per hr total from human body heat dissipation and lights. The installation of a canopy type exhaust system in addition to uniformly distributed combination supply, return, and exhaust ventilating systems throughout the entire space, results in the removal at the source of the heat contained in the products of combustion, leaving only radiant heat liberated to the room.

The estimated sensible and latent loads indicated a sensible ratio of 98 per cent of the total internal heat load, requiring 16,000 cfm to maintain 85 F inside temperature and 50 per cent relative humidity when the outdoor conditions are 95 F dry bulb and 75 F wet bulb.

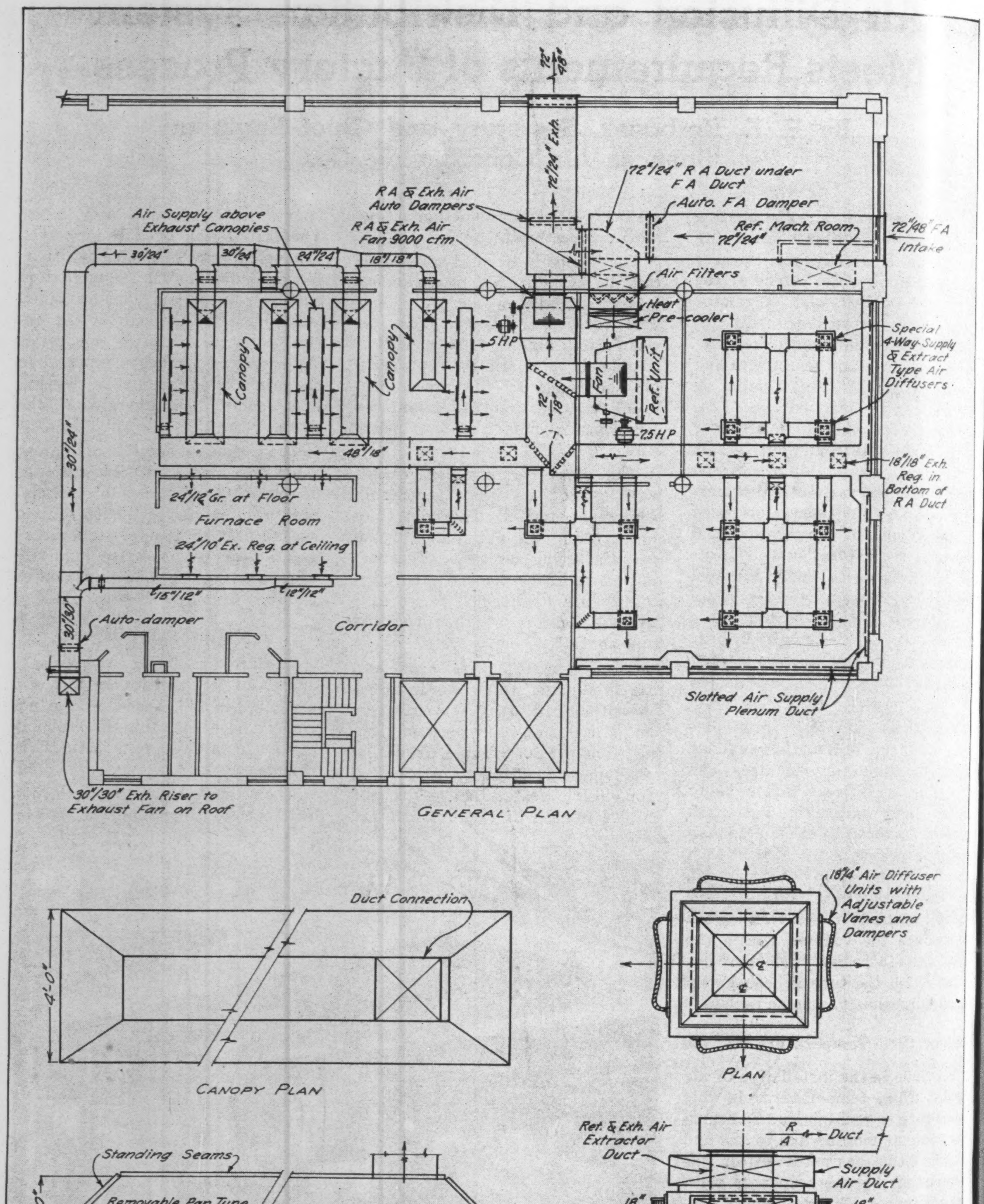
### 1½ Minute Air Change

The gross content of the space is 32,800 cu ft, resulting in a 2 min air change, and, based on the net cubic content, this is probably closer to a 1½ min actual air change.

The air volume requirements, with the resulting rapid air change,



This view of one of the canopies indicates their construction


72"/48"
72"/24" Exh.
72"/24" R A Duct under F A Duct
Auto. F A Damper
R A & Exh. Air Auto Dampers
Air Supply above Exhaust Canopies
R A & Exh. Air Fan 9000 cfm
Ref. Mach. Room
72"/24"
72"/48" F A Intake
30"/24"
30"/24"
24"/24"
18"/18"
Air Filters
Heat
Pre-cooler
5 HP
Canopy
Canopy
Fan
Ref. Unit
72"/18"
7.5 HP
Special 4-Way-Supply & Extract Type Air Diffusers
48"/18"
18"/18" Exh. Reg. in Bottom of R A Duct
30"/24"
24"/12" Gr. at Floor
Furnace Room
24"/10" Ex. Reg. at Ceiling
15"/12"
12"/12"
30"/30"
Auto-damper
Corridor
Slotted Air Supply Plenum Duct
30"/30" Exh. Riser to Exhaust Fan on Roof
GENERAL PLAN
Duct Connection
4'-0"
CANOPY PLAN
18"/4" Air Diffuser Units with Adjustable Vanes and Dampers
PLAN
Standing Seams
2'-0"
6"
Removable Pan Type Baffles
2" X 1½" X 3/16" Ls
20'-0"
1½" Intermediate & Periphery Exh. Air Slots
SECTIONAL ELEVATION EXHAUST CANOPIES
Ret. & Exh. Air Extractor Duct
R A Duct
Supply Air Duct
18"/4"
18"/4"
18"/18" R A Reg.
ELEVATION
SPECIAL AIR DIFFUSER

necessitated careful study and consideration of the matter of introduction and distribution of the air over the area served.

After numerous tests, and study of various methods of distribution and diffusion, it was found that elimination of drafts and distortion of the gas flames required uniform distribution of the air at low velocities and over small areas. Accurate adjustment and close control of air volumes and velocities were also found to be necessary.

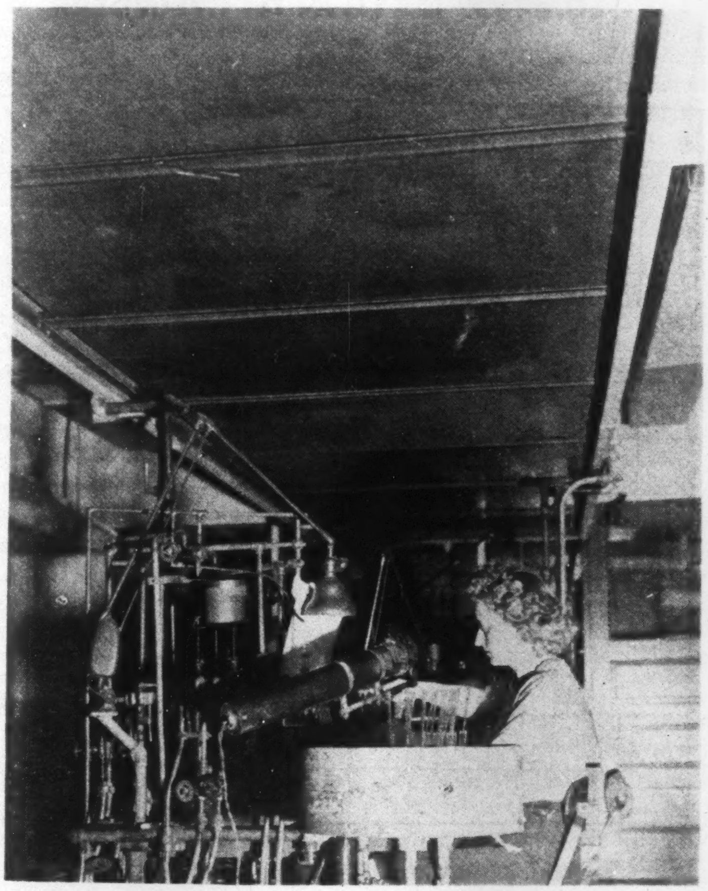
A special air diffuser was designed to include supply and exhaust air in each individual unit, with each unit supplying air uniformly through a 360 deg area and having adjustment and control of diffusion both in a horizontal and vertical direction. This special air diffuser unit is shown in the accompanying drawing. These units are located at 7 ft 0 in. from the floor and on the quarter points of each 25 ft bay, resulting in a 6 ft 0 in. air throw from the centerline of each unit. Each of these twelve special air diffuser units is designed for a capacity of 500 cfm, or a total of 6000 cubic feet of air per minute.

In addition to these internal area diffusers, periphery slotted plenum air chambers are installed directly above the large exposed glass subjected to solar heat, as shown in the drawing. These slots discharge downward, blanketing the entire glass surfaces, and are adjustable at intervals of 30 in. lengths by means of slide type dampers to change the slot orifice size, volume, and velocities. The air curtain system for the window surfaces has a capacity of 3000 cfm.

## Exhaust Canopies Over Machines

Exhaust canopies are installed over the automatic tubulator machines. These canopies are 20 ft long by 4 ft wide and are of the inner pan construction having 1½ in. periphery, and intermediate slots to reduce the volume of exhaust air requirements and maintain an average of 300 fpm slot velocities. These canopies are connected to a separate atmospheric exhaust system having a capacity of 7500 cfm, which requires that at least this amount of new air be introduced to the space by the air conditioning system at all times. None of the air from the canopy section of the space is returned to the air conditioning system.

**MANUFACTURING processes represent an additional factor to be considered by the air conditioning engineer and contractor in the design and installation of ventilation and conditioning systems in industry. In the case described here, air conditioning and ventilation are essential for the comfort, health, and efficiency of workers in a mercury switch department, but the effect of air movement on finely adjusted gas flames used by expert glass operators is a primary consideration. How the requirements were met by separate air systems and special diffuser units is explained.**



Looking up at one of the exhaust canopies, which are 20 ft long by 4 ft wide

The air conditioning system is designed and arranged to introduce up to 100 per cent new air to the space when desired by the combination return and exhaust air fan system installed in connection with the supply system.

The estimated total refrigerating load for this space, with the introduction of new air to serve the hood exhaust system, is 86 tons.

The air conditioning equipment includes air cleaning filters, preheat coils, 48 ton capacity precooling coils through which well water is circulated, and final cooling and dehumidifying accomplished by a refrigerated water sprayed coil unit connected to a 38 ton "Freon" refrigerating machine. Waste water from the precooling coils serves as condenser water for the refrigerating machine, thereby effecting an economical operating cost for the split system of cooling and dehumidifying.

Plenum type supply and return air mains run throughout the length of the space, with branch ducts to the supply and extract type diffusers. The supply main terminates at the slotted air plenum above glass window surfaces.

**Slotted plenum air chambers blanket the glass surfaces on the outside walls, as shown at the left side of this picture. Two of the special air diffuser units are also shown here**

A combination return and exhaust air fan is installed and connected to the return air main. This fan has a capacity of 9000 cfm and is arranged with automatic static pressure control equipment to either return air to the air conditioning equipment or exhaust to atmosphere in proportion to new air introduced. Since the canopy exhaust system fixes the minimum new air requirements, a corresponding minimum setting is incorporated in the automatic fan control.

Control of ventilating and air conditioning within this space is by means of a complete system of pneumatic controls. Outdoor, return, and exhaust air dampers are motorized and controlled by electric pneumatic switches interconnected with the holding coils on the fan motor starters and modulated by static pressure and limit control instruments.

Other production processes outside of this air conditioned space are served by numerous exhaust ventilating systems for removal of acid fumes from the etching process, heat, glass dust from cutoff saws, etc. A total of approximately 46,200 cfm capacity air handling equipment and ventilating systems are installed for the entire process.

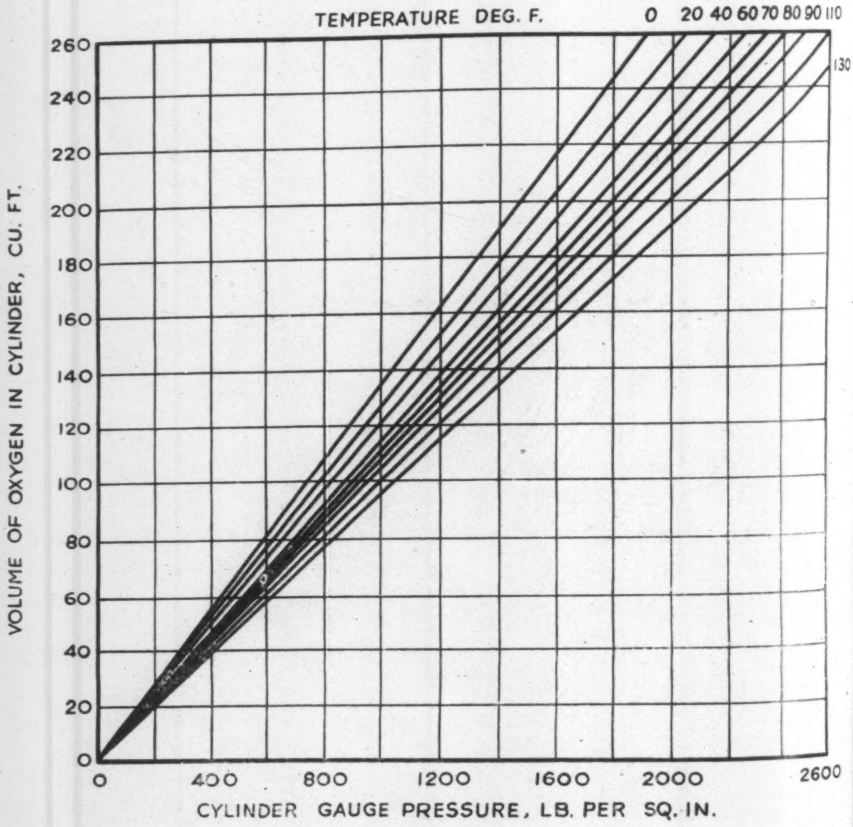
This chart has been drawn to allow a welding operator to estimate the volume of oxygen remaining in a cylinder. For example, if the regulator indicates a cylinder pressure of 1400 lb per sq in., and the room temperature is 60 F, there is approximately 160 cu ft of oxygen in the cylinder. (Courtesy Linde Air Products Co.)

## PLANS EXPANDED PUBLIC RELATIONS PROGRAM

An expanded program to provide for a larger volume of publicity was presented at the annual meeting of the Plumbing and Heating Industries Bureau on November 8 in Chicago. The plan met with general approval.

Henry S. Blank, Dayton, former president of the National Association of Master Plumbers, was elected president of the bureau. A. B. Anderson, president of the Duluth Plumbing Supplies Co., was chosen vice-president, and E. N. McDonnell, Chicago, president of McDonnell & Miller, was re-elected treasurer. Norman J. Radder was re-elected secretary.

**VOLUME OF OXYGEN IN CYLINDERS**



# A SMOKE ELIMINATION Program THAT WORKS . . . .

## Raymond R. Tucker Discusses Rules for Stoker Installations

Use of mechanical fuel burning equipment is one of the cardinal principles upon which the St. Louis smoke ordinance is based. Smokeless and efficient operation are expected from the use of equipment of this type. The achievement of this goal demands that certain standards must be adhered to, and that these standards should govern all those factors pertinent to smokeless operation.

Previous to 1938, St. Louis had no specific rules governing the installation of any fuel burning equipment. This condition was not peculiar to St. Louis. As in many other cities, hundreds of its citizens were engaged in the selling, distributing, and installing of fuel-burning equipment; among this group were a considerable number who were not even aware of the basic principles involved in smokeless combustion. Boilers, furnaces, stokers, oil burners, and gas burners were—in many cases—sold without thought being given to capacity or adaptability to the job under consideration. Rarely were surveys made to determine the connected load, and—if made—were often not properly interpreted. Thus, due to the diversity of talent and ability engaged in the fuel burning industry, numerous faulty and unsatisfactory installations were made.

### Improper Equipment Application Sabotages Smoke Program

The division of smoke regulation recognized that these conditions existed, and felt obligated to correct them if possible. Experience had taught the division that no matter how perfectly conceived a smoke program may be, it can be sabotaged by improper application of fuel burning equipment.

To correct these conditions, certain basic standards were established. In addition, an application blank for the installation of all fuel burning equipment was supplied to the installers. This blank requires the submission of data on the connected load (direct and indirect), type of boiler, manufacturer's number, and furnace dimensions. Supplemental data such as size and type of building, height of stack, and type of fuel burning equipment are also required.

The load recommendations of the Heating, Piping and Air Conditioning Contractors National Association are accepted for sizing all domestic and commercial steam and hot water boilers. The formulas of the National Warm Air Heating and Air Conditioning Association are used to rate both gravity and mechanical warm air furnaces when the manufacturer's rating is not available. The heat transfer factors of the American Society of Heating and Ventilating Engineers were adopted for the computation of all heat losses. The use of these standards assures the proper relationship between load and boiler or furnace. More information, however, had to be made available to the industry for the sizing and installation of mechanical fuel burning equipment. All high pressure installations are considered as separate and individual cases, and approved and accepted practice is required on these installations. Codes were established for low pressure installations where the net load requirements reach a maximum of 30,000 sq ft of steam radiation. Two codes were set up for this purpose, one for stokers and the other for oil burners. These codes, besides giving such fundamental definitions as were necessary, go into detail on combustion volume; clear height; method of sizing of stokers for hot water, steam, and warm air jobs; and other essential requirements for the proper combustion of fuel.

### The Stoker Code

This article will consider only the stoker code because it is one of the principal mediums by which high volatile solid fuel may be burned smokelessly. This result can only be achieved if the combustion volume, clear height, and the size of the stoker are in balance. It is essential that the installer know the size of the stoker which is permitted to be installed in the boiler under consideration. To aid him in making this choice, the code outlines in detail the manner in which a stoker shall be sized. It is, of course, definitely understood that the major portion of the installations that are made are conversion jobs. This means that the stoker must be adapted to the equipment which is already in place.

An efficiency of 65 per cent is assumed for the overall efficiency of the boiler furnace and grate. Pick-up load and pipe loss is assumed to represent an additional $33\frac{1}{3}$ per cent loss. The average calorific value of the coal is assumed to be 11,000 Btu per lb. With these assumptions, it is estimated that 4.5 lb per hr of coal would have to be burned for every 100 sq ft of direct steam radiation. This burning rate applies to low pressure domestic installations of 1000 sq ft of direct steam radiation or less. For all heating plants in excess of 1000 sq ft DSR,* a burning rate of 5 lb per hr of coal per 100 sq ft of DSR was required because of the lower calorific value of the fuel used, viz., 10,000 Btu per lb. The expressions, 4.5 lb per hr or 5 lb per hr of coal, will be used in the following paragraphs subject to these conditions. The methods outlined in the code for sizing stokers are as follows:

When the total net load is less than the certified hand fired rating of the boiler, and greater than 50 per cent of this certified hand fired rating, the stoker shall be of sufficient size to burn 4.5 lb per hr (5 lb per hr) of coal for each 100 sq ft of the boiler's certified hand fired rating. To illustrate:

Certified hand fired rating $= 676$ sq ft DSR
Connected load, 960 sq ft hot water $= 600$ sq ft EDR†
Stoker capacity, lb per hr of coal $= (676/100) \times 4.5 = 30.4$
Capacity of stoker installed $= 30$ lb per hr

When the total net load is less than 50 per cent of the certified hand fired rating, the stoker shall be of sufficient size to meet the net load plus 70 per cent of the difference between the net load and the certified hand fired rating of the boiler. This stoker also shall have the capacity of burning 4.5 lb per hr (5 lb per hr) of coal for each 100 sq ft of load. To illustrate:

Certified hand fired rating $= 6885$ sq ft DSR
Total net connected load $= 3300$ sq ft DSR
Load for stoker sizing $= 0.7(6885 - 3300) + 3300 = 5800$ sq ft
Stoker capacity, lb per hr coal $= (5800/100) \times 5 = 290$
Capacity of stoker installed $= 300$ lb per hr

When the net load exceeds the certified hand fired rating and is less than 125 per cent thereof, the stoker shall be of sufficient size to burn 4.5 lb per hr (or 5 lb per hr) of coal for each 100 sq ft of net load.

No permit is issued for stoker installations in standard or commercial boilers where the net load exceeds 125 per cent of the certified hand fired rating. On the other hand, if the boiler is of a type designed exclusively for mechanical firing and no hand fired rating is available, the stoker shall be sized on the total net load provided this load is between 80 and 100 per cent of the mechanically fired rating, and on 80 per cent of the mechanically fired rating if the total net load is less than this amount. Permits are not issued for the installation of stokers in boilers of this type if the total net load exceeds the mechanical fired rating.

**THIS ANALYSIS of the regulations governing stoker installations in St. Louis clearly demonstrates the control of all factors pertinent to the elimination of smoke at its sources. . . . Professor Tucker is well qualified to write on smoke elimination, for he has been intimately concerned with the program in St. Louis. Now head of the department of mechanical engineering at Washington University in that city, he was smoke commissioner of St. Louis from 1937 to 1942. In addition to many talks on smoke elimination before various groups in St. Louis, he has also discussed the program at engineering meetings in cities where it is hoped to inaugurate similar projects. . . . Previous articles of this series were published in the September and the October-November issues of Heating, Piping & Air Conditioning**

The reasons for the above rules are obvious. There were some who desired to stoker the net load. This would result in an inefficient, smoky, and unsatisfactory installation when the net load was far below the capacity of the boiler. The stokering of boilers up to 125 per cent of their hand fired rating is justified because of the increased efficiency with stoker firing over hand firing.

## Sizing Stokers for Furnaces

The method pursued in sizing stokers for warm air furnaces is entirely different from that used for hot water and steam. The line of demarcation between domestic stokers and commercial stokers is again 1000 sq ft DSR, or 240,000 Btu per hr at the registers. The overall efficiency of the furnace and grate is again assumed as 65 per cent. A pick-up load of 25 per cent and a radiation loss from the leader pipes of 15 per cent are assumed. The calorific value of fuel is assumed as 11,000 Btu per lb for installations below 240,000 Btu, and 10,000 Btu per lb for those above 240,000 Btu. The formulas resulting from this approach for gravity warm air below 240,000 Btu at the register are as follows:

Stoker capacity, lb per hr of coal $= 2.92\,L$
Stoker capacity, lb per hr of coal $= 0.214\,H$

For loads in excess of 240,000 Btu at the register—

Stoker capacity, lb per hr of coal $= 0.236\,H$
Stoker capacity, lb per hr of coal $= 3.22\,L$

The mechanical warm air units below and above 240,000 Btu at the registers are sized on the same basis of calorific value of fuel. A 15 per cent loss in the leader pipe with a 15 per cent pick-up load and a furnace and grate efficiency of 65 per cent are the other assumptions made. This results in—

**Stoker capacity, lb per hr of coal $= 0.189\,H$ (for less than 240,000 Btu per hr)**
**Stoker capacity, lb per hr of coal $= 0.208\,H$ (for more than 240,000 Btu per hr)**

Note: $L$ in the above formulas is the total load in 100 sq in. of leader pipe area with carrying capacity of 136 Btu for each square inch, and $H$ is the total load in 1000 Btu per hr.

The total load is determined by taking the requirements of the building to be heated plus any indirect load such as domestic hot water. If this load is equal to or greater than 85 per cent of the hand fired rating of the furnace, these requirements are used for *L* or *H*. If—on the other hand—the requirements as computed are less than 85 per cent of the hand fired rating of the furnace, *H* and *L* are taken to be 85 per cent of the hand fired rating of the furnace.

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*Direct steam radiation = 240 Btu per hr per sq ft.

†Equivalent direct radiation = 240 Btu per hr per sq ft.

Example—Gravity warm air system:

Furnace rating
$= 638$ sq in. of leader pipe

Connected load
$= 580$ sq in. of leader pipe

85 per cent of rating
$= 638 \times 0.85 = 543$ sq in.

Stoker capacity required
$= (580/100) \times 2.92 = 16.9$ lb per hr

Capacity of stoker installed
$= 20$ lb per hr

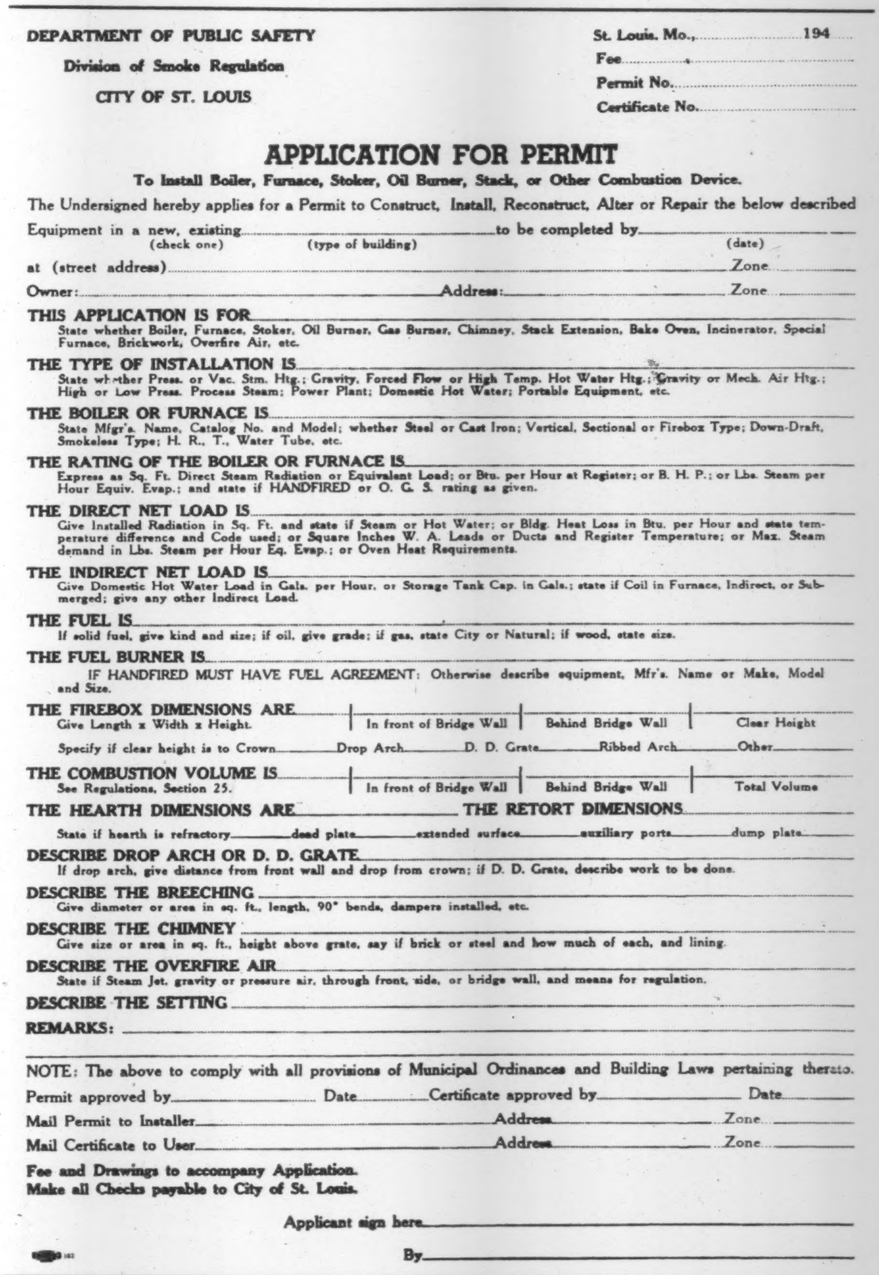
No permits are issued for installing mechanical firing in existing warm air heating systems in which the requirements of the building as computed are greater than the mechanically fired rating of the furnace, or greater than the capacity of the existing individual or trunk line supply system as defined in the codes of the National Warm Air Heating and Air Conditioning Association.

There are some stokers in the city of St. Louis burning semi-bituminous coal. They are of the non-clinkering type. In sizing these stokers a value of 3.5 lb per hr of coal per 100 sq ft DSR is used. The reduction from 4.5 to 3.5 lb per hr of fuel is due to the difference in heating value of the fuels.

## Additional Information in Code

As a further aid to the installer, sample calculations are made in the code showing how the above rules are applied. The size of the stoker having been determined, the code proceeds to discuss and specify the necessary combustion volume as well as clear height. The combustion volume and clear height must be of adequate size to allow ample time for the chemical reactions to take place before the combustion gases come into contact with the relatively cool surfaces of the boiler.

In conversion jobs there exist all forms, types, and shapes of furnaces—consequently the definition of combustion volume becomes a highly controversial matter. The combustion volume as defined in the St. Louis code is the volume immediately above the hearth and extending in a vertical direction from the top of the tuyeres to the center crown sheet, or the bottom of the water grates if they have not been removed. This definition precludes the inclusion of the volume behind the bridge wall. An allowance of 25 per cent of the total volume required is permitted behind the bridge wall provided such volume actually exists.



**DEPARTMENT OF PUBLIC SAFETY**
**Division of Smoke Regulation**
**CITY OF ST. LOUIS**

St. Louis. Mo., .................... 194 ....
Fee ....................
Permit No. ....................
Certificate No. ....................

**APPLICATION FOR PERMIT**

**To Install Boiler, Furnace, Stoker, Oil Burner, Stack, or Other Combustion Device.**

The Undersigned hereby applies for a Permit to Construct, Install, Reconstruct, Alter or Repair the below described Equipment in a new, existing (check one) ____________ (type of building) to be completed by ____________ (date)

at (street address) ____________ Zone ____________

Owner: ____________ Address: ____________ Zone ____________

**THIS APPLICATION IS FOR** ____________
State whether Boiler, Furnace, Stoker, Oil Burner, Gas Burner, Chimney, Stack Extension, Bake Oven, Incinerator, Special Furnace, Brickwork, Overfire Air, etc.

**THE TYPE OF INSTALLATION IS** ____________
State whether Press. or Vac. Stm. Htg.; Gravity, Forced Flow or High Temp. Hot Water Htg.; Gravity or Mech. Air Htg.; High or Low Press. Process Steam; Power Plant; Domestic Hot Water; Portable Equipment, etc.

**THE BOILER OR FURNACE IS** ____________
State Mfgr's. Name, Catalog No. and Model; whether Steel or Cast Iron; Vertical, Sectional or Firebox Type; Down-Draft, Smokeless Type; H. R., T., Water Tube, etc.

**THE RATING OF THE BOILER OR FURNACE IS** ____________
Express as Sq. Ft. Direct Steam Radiation or Equivalent Load; or Btu. per Hour at Register; or B. H. P.; or Lbs. Steam per Hour Equiv. Evap.; and state if HANDFIRED or O. G. S. rating as given.

**THE DIRECT NET LOAD IS** ____________
Give Installed Radiation in Sq. Ft. and state if Steam or Hot Water; or Bldg. Heat Loss in Btu. per Hour and state temperature difference and Code used; or Square Inches W. A. Leads or Ducts and Register Temperature; or Max. Steam demand in Lbs. Steam per Hour Eq. Evap.; or Oven Heat Requirements.

**THE INDIRECT NET LOAD IS** ____________
Give Domestic Hot Water Load in Gals. per Hour, or Storage Tank Cap. in Gals.; state if Coil in Furnace, Indirect, or Submerged; give any other Indirect Load.

**THE FUEL IS** ____________
If solid fuel, give kind and size; if oil, give grade; if gas, state City or Natural; if wood, state size.

**THE FUEL BURNER IS** ____________
IF HANDFIRED MUST HAVE FUEL AGREEMENT: Otherwise describe equipment, Mfr's. Name or Make, Model and Size.

**THE FIREBOX DIMENSIONS ARE** ____ | ____ In front of Bridge Wall | ____ Behind Bridge Wall | ____ Clear Height
Give Length x Width x Height.

Specify if clear height is to Crown ____ Drop Arch ____ D. D. Grate ____ Ribbed Arch ____ Other ____

**THE COMBUSTION VOLUME IS** ____ | ____ In front of Bridge Wall | ____ Behind Bridge Wall | ____ Total Volume
See Regulations, Section 25.

**THE HEARTH DIMENSIONS ARE** ____________ **THE RETORT DIMENSIONS** ____________

State if hearth is refractory ____ dead plate ____ extended surface ____ auxiliary ports ____ dump plate ____

**DESCRIBE DROP ARCH OR D. D. GRATE** ____________
If drop arch, give distance from front wall and drop from crown; if D. D. Grate, describe work to be done.

**DESCRIBE THE BREECHING** ____________
Give diameter or area in sq. ft., length, 90° bends, dampers installed, etc.

**DESCRIBE THE CHIMNEY** ____________
Give size or area in sq. ft., height above grate, say if brick or steel and how much of each, and lining.

**DESCRIBE THE OVERFIRE AIR** ____________
State if Steam Jet, gravity or pressure air, through front, side, or bridge wall, and means for regulation.

**DESCRIBE THE SETTING** ____________

**REMARKS:** ____________

NOTE: The above to comply with all provisions of Municipal Ordinances and Building Laws pertaining thereto.

Permit approved by ____________ Date ____ Certificate approved by ____________ Date ____

Mail Permit to Installer ____________ Address ____________ Zone ____

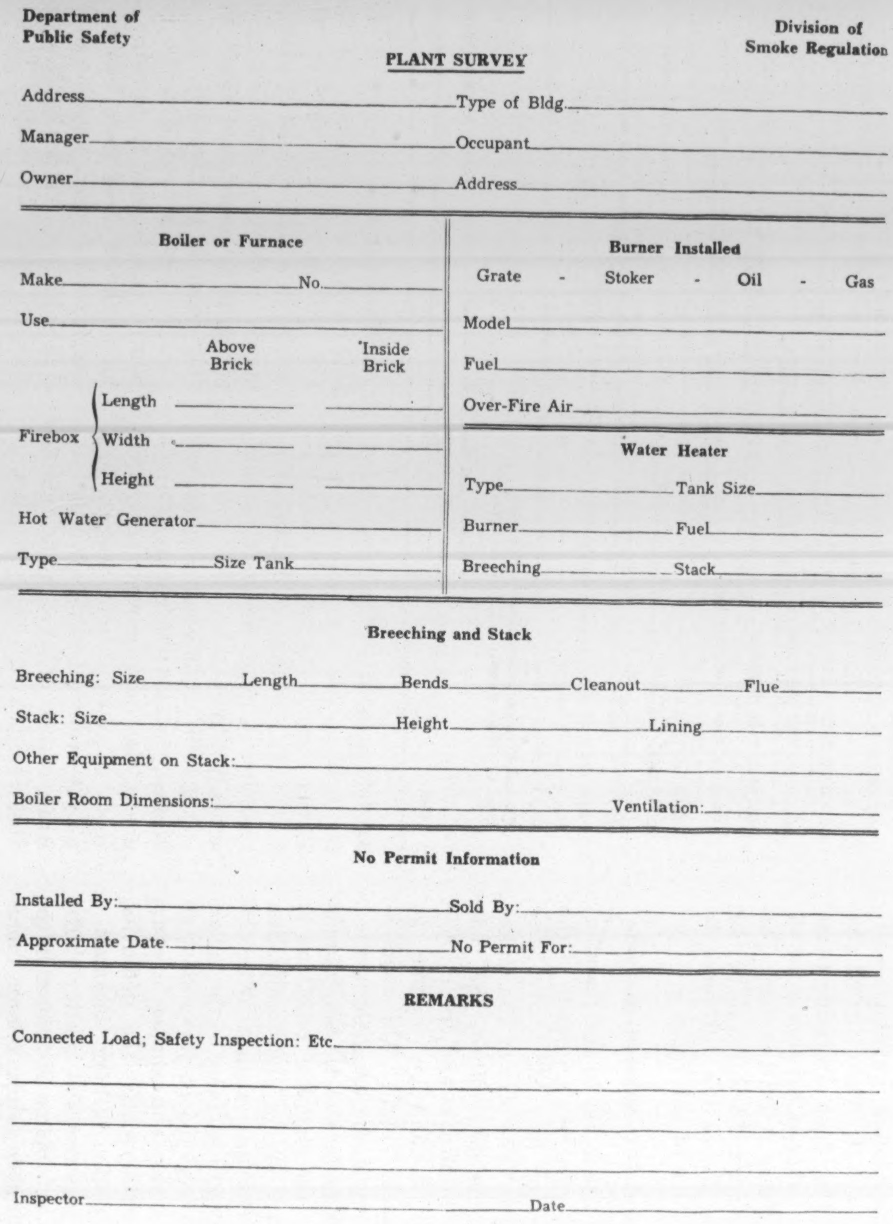
Mail Certificate to User ____________ Address ____________ Zone ____

**Fee and Drawings to accompany Application.**
**Make all Checks payable to City of St. Louis.**

**Applicant sign here** ____________

**By** ____________

After the combustion volume was defined, the question naturally arose as to the heat release per cubic foot of combustion space. Due to the wide variation in the calorific value of the high volatile fuels on the St. Louis market, it was decided not to specify the heat release in Btu per hr per cu ft of combustion space. Instead, it is specified on the basis of lb per hr of coal per cu ft of combustion space. For domestic or semi-industrial installations, 1 cu ft of combustion space is required for each 4 lb per hr of coal burned. This results in a heat release of approximately 40,000 to 50,000 Btu per hr per cu ft of combustion space. This may seem to be excessive, but experience has proved it to be eminently satisfactory in burning the high volatile coals from Illinois. If overfire air is used, an allowance of 5 lb per hr of coal per cu ft of combustion space is made. This in-



**Department of Public Safety**

**Division of Smoke Regulation**

**PLANT SURVEY**

Address________ Type of Bldg.________

Manager________ Occupant________

Owner________ Address________

**Boiler or Furnace**

Make________ No.________

Use________

| | | Above Brick | Inside Brick |
|---|---|---|---|
| Firebox | Length | | |
| | Width | | |
| | Height | | |

Hot Water Generator________

Type________ Size Tank________

**Burner Installed**

Grate - Stoker - Oil - Gas

Model________

Fuel________

Over-Fire Air________

**Water Heater**

Type________ Tank Size________

Burner________ Fuel________

Breeching________ Stack________

**Breeching and Stack**

Breeching: Size________ Length________ Bends________ Cleanout________ Flue________

Stack: Size________ Height________ Lining________

Other Equipment on Stack:________

Boiler Room Dimensions:________ Ventilation:________

**No Permit Information**

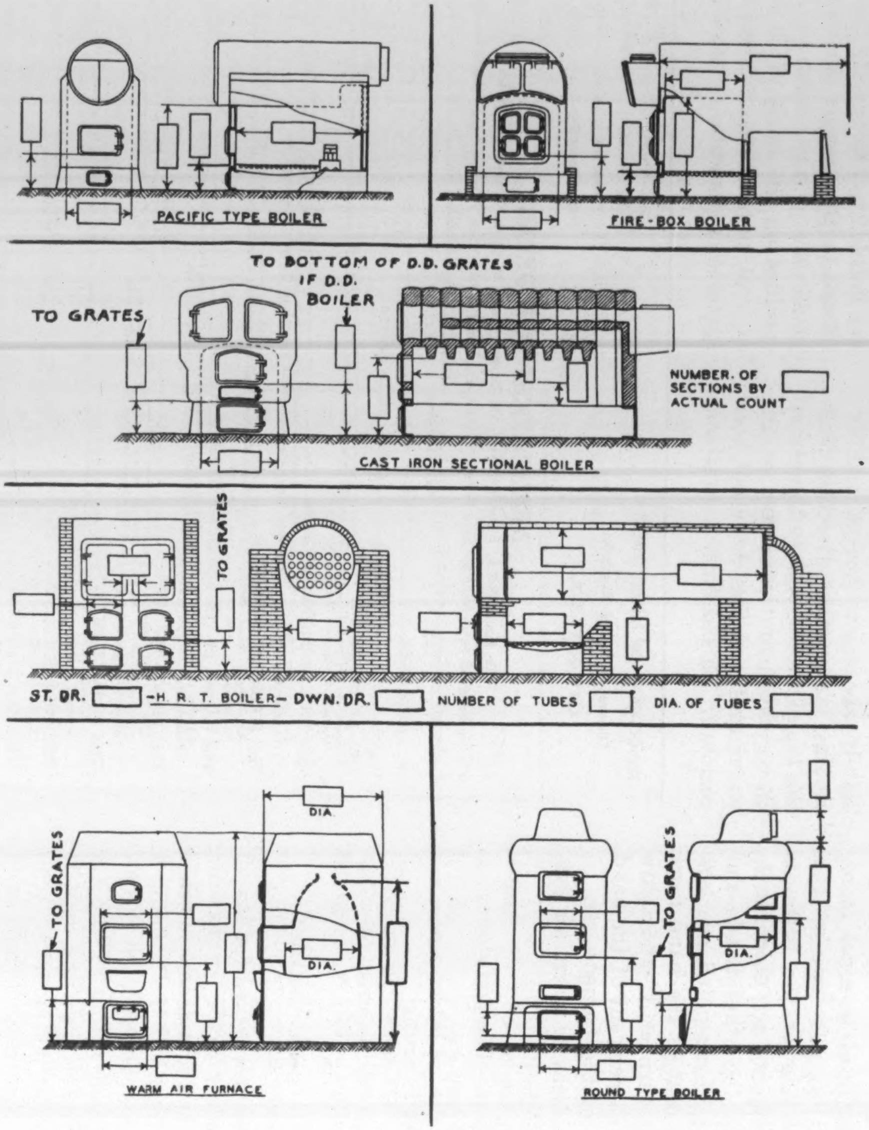
Installed By:________ Sold By:________

Approximate Date________ No Permit For:________

**REMARKS**

Connected Load; Safety Inspection: Etc________

Inspector________ Date________


PACIFIC TYPE BOILER
FIRE-BOX BOILER
TO BOTTOM OF D.D. GRATES IF D.D. BOILER
TO GRATES
NUMBER OF SECTIONS BY ACTUAL COUNT
CAST IRON SECTIONAL BOILER
TO GRATES
ST. DR.
-H. R. T. BOILER-
DWN. DR.
NUMBER OF TUBES
DIA. OF TUBES
DIA
TO GRATES
DIA.
WARM AIR FURNACE
TO GRATES
DIA.
ROUND TYPE BOILER

Front and back of St. Louis plant survey form crease is granted because of the turbulence created by the overfire jets, resulting in a more effective use of the combustion space.

### Clear Height a Factor

There still remains, after the establishment of the above requirements, another basic factor in the smokeless operation of any stoker. This is the clear height. To obviate any misunderstanding as to what clear height is, the code specifically states that the clear height is the difference between the top of the tuyeres and the crown sheet or center of the furnace. Due to the heterogeneous group of boilers installed in St. Louis, some restrictions had to be placed upon this definition. The definition of clear height prevails when no obstruction exists above the hearth, or within 18 in. horizontally in the direction of the gas flow from the nearest margin of the tuyeres. It is required that all tubes of downdraft grates in steel boilers be removed, with the exception of two tubes on each side of the furnace; otherwise the clear height is taken to the bottom of the water grate. Boilers having a drop arch from the top of the furnace, and a distance less than 18 in. in the horizontal direction of the gas flow to the nearest margin of the tuyeres, are required to have a clear height from the top of the tuyeres to the drop arch of not less than 66⅔ per cent of the required clear height. To aid in the interpretation of these definitions, Table 1 is presented for the consideration of the installers.

There are some exceptions to the clear height requirements shown in Table 1. Stokers may be installed in round cast iron vertical boilers without pitting or without raising the boiler, provided the certified hand fired ratings of these boilers do not exceed 400 sq ft of steam radiation. This permission is granted only in those cases where the stoker is so equipped that its burning rate cannot be increased beyond the required net load as determined by the section of the code on sizing stokers.

The clear height is not always the governing factor. If the combustion volume can be obtained with a clear height below that specified, it is not acceptable but has to be increased to meet the clear height specifications; on the other hand, if the combustion volume cannot be had with the recommended clear height it must be increased until such volume is had. These clear heights were determined after consultation with the St. Louis Stoker Association, and are the result of successful experience.

Table 1—Clear Heights

| Maximum Burning Rate, Lb Per Hr | Net Load Requirements, Sq Ft of Steam Radiation | Minimum Clear Height to Crown, In. | Minimum Clear Height to Drop Arch, In. |
|---|---|---|---|
| 20 | 444 | 18 | 12 |
| 25 | 555 | 19 | 12½ |
| 30 | 666 | 20 | 13½ |
| 35 | 777 | 21½ | 14½ |
| 40 | 888 | 22½ | 15 |
| 45 | 1,000 | 23 | 15½ |
| 50 | 1,001 | 24 | 16 |
| 60 | 1,200 | 25½ | 17 |
| 70 | 1,400 | 26½ | 17½ |
| 75 | 1,500 | 27 | 18 |
| 80 | 1,600 | 27½ | 18 |
| 90 | 1,800 | 28 | 18½ |
| 100 | 2,000 | 29 | 19½ |
| 125 | 2,500 | 30 | 20 |
| 150 | 3,000 | 31 | 20½ |
| 175 | 3,500 | 32 | 21 |
| 200 | 4,000 | 33 | 22 |
| 250 | 5,000 | 34½ | 23 |
| 300 | 6,000 | 36 | 24 |
| 350 | 7,000 | 37 | 24½ |
| 400 | 8,000 | 39 | 26 |
| 450 | 9,000 | 40 | 27 |
| 500 | 10,000 | 41½ | 28 |
| 600 | 12,000 | 44 | 29 |
| 650 | 13,000 | 45 | 30 |
| 700 | 14,000 | 46 | 30½ |
| 750 | 15,000 | 47½ | 31½ |
| 800 | 16,000 | 48 | 32 |
| 1000 | 20,000 | 51½ | 34 |
| 1250 | 25,000 | 54 | 36 |
| 1500 | 30,000 | 56 | 37½ |

With this definition of combustion volume and clear height, and with their limitations definitely specified, the installer is able to make a reasonable estimate of the cost of his installation—at least he is in a position to know whether the stoker is to be pitted or not.

The following example is presented to demonstrate the above principles:

Stoker size (from previous example)
$= 300$ lb per hr
Required minimum clear height (from Table 1)
$= 36$ in.
Hearth dimensions in front of bridge wall
$= 36$ in. $\times$ 68 in.
Hearth area
$= (36 \times 68)/144 = 17$ sq ft
Combustion volume required
$= 300/4 = 75$ cu ft
75 per cent of combustion volume in front of bridge wall
$= 75 \times 0.75 = 56.25$ cu ft
Height from top of tuyere to crown necessary to give combustion volume
$= 56/17 = 3.3$ ft $= 40$ in.
Allowable combustion volume behind bridge wall
$= 18.75$ cu ft

As a result of the above method of sizing stokers, the citizens of St. Louis are assured of purchasing equipment that adequately takes care of their heating requirements as well as the industrial requirements of the plant. However, when this method of sizing is used, it is not unusual for the required burning rate of the stoker to fall below the maximum burning rate of the equipment to be installed. If this is the case the stoker then has to be adjusted until its maximum burning rate is approximately equal to the demands of the installation.

### Three Very Definite Limitations

There are three very definite limitations placed upon every installation, viz., clear height, volume, and burning rate of the stoker. These three requirements must be satisfied, and if the burning rate of the stoker cannot be adjusted to the requirements, its installation is not permitted.

With the widespread installation of stokers, a condition arose which necessitated additional regulation. It was found that stokers with a capacity of 100 lb per hr and over were prone to violate the ordinance during the off periods. To remedy this condition a supplementary stoker application form is requested, which must show the means by which the installer intends to control this type of violation.

The division of smoke regulation at no time assumes the position of a consultant. It never specifies a solution to any problem, but merely reserves the right of veto. The division never, by implication or by

**USE THIS ARTICLE and the others to follow on smoke elimination in St. Louis in your own community to inform city officials and your fellow-citizens on what can be done, and how it was done in this particular case. Abating smoke—of vital concern and advantage to all—is an engineering job**

direct recommendation, endeavors to prescribe the design of a stoker or the materials to be used in the installation of the stoker. All classes of stokers are accepted, provided they adhere to the fundamental principles governing the design of such fuel burning equipment and to the prescribed conditions of installation.

The code as outlined so far describes the manner in which stokers are to be installed in more or less conventional types of equipment. Besides this conventional type of equipment there are many special boilers and furnaces such as vertical boilers, scotch marine boilers, tar kettles, and incinerators. These installations receive special attention and are not permitted to be installed unless it is agreed in writing to use smokeless fuel. Mechanical fuel burning equipment installed in this type of equipment is approved only where such equipment, or furnace, is specially designed for these installations.

### Many General Provisions

The code also contains many general provisions. These general provisions touch on the type of control, ledge distance, chimney size, fly ash, boiler room ventilation, barometric dampers, and cleanout doors. These items are included because they directly or indirectly affect the smokeless and efficient operation of the equipment.

A minimum ledge distance of at least 4 in. from the inner edge of the tuyeres is required on all sides of standard underfeed stokers. A further limitation states that this ledge be either in a horizontal plane or sloping downward toward the furnace wall. If storage space for the clinker is not provided, serious violations occur during the cleaning periods. To avoid smoke violations during the cleaning operation, reasonable care and attention must be exercised. This care and attention will not exist if the cleanout door is inconveniently located, or is of insufficient size. Consequently, the division carefully checks this item of installation.

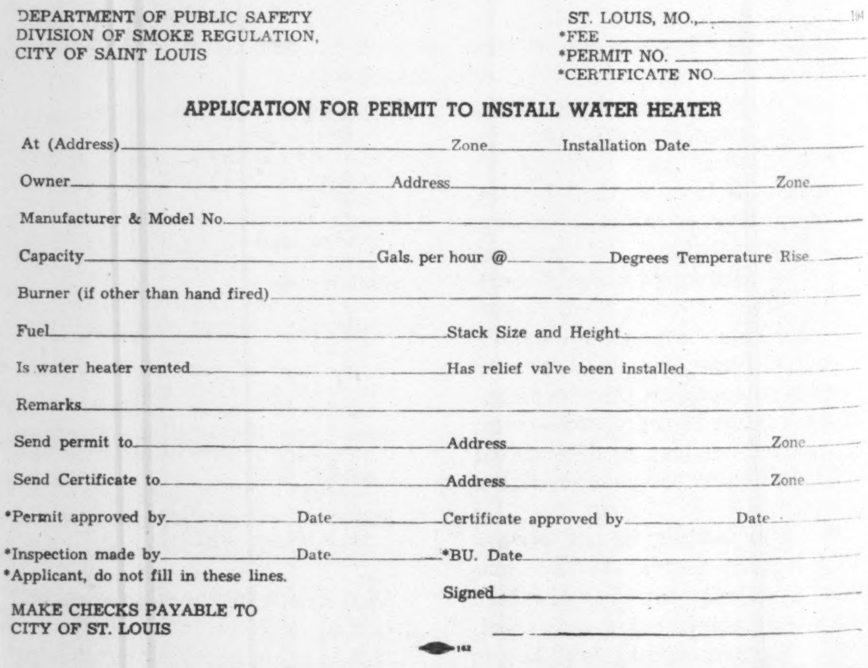
Adequate draft is always essential for efficient and smokeless operation, so the chimney size is specified. It is to be of such height and cross-sectional area as to produce a minimum draft of 0.04 in. of water above the furnace bed when the equipment is operated at rated load. A corollary to the draft requirements is the location of the fuel burning equipment in the basement. It is not unusual to find the furnace room hermetically sealed with no provision being made for the admission of air. One installation in particular is recalled where exhaust fans were installed in the boiler room. These fans were discharging to the outside and the boiler room was under a negative pressure.

To eliminate these conditions, plans and specifications of the room or premises in which the fuel or refuse burning equipment is to be located must accompany each application. These plans must show provision for doors, windows, air shafts, or other means of ventilation of sufficient capacity to provide that the atmosphere of any such room or basement wherein the fuel or refuse burning apparatus is located will be changed every 10 minutes.

It should be noted that each provision of the stoker code conforms to the fundamental principle of the St. Louis program—the elimination of smoke at its source. These regulations have been in effect for seven years; changes have been made when experience dictated they were needed.

These codes (as any code) do not represent the optimum conditions, but the minimum requirements essential to satisfactory installations. They are simple in content and are suitable for those of broad as well as limited experience. They are not universal in scope nor were they intended to be so. They may be adapted to other communities after due consideration has been given to all pertinent factors. They do, however, meet the conditions as they exist in St. Louis.

The codes were compiled with the cooperation of the St. Louis Stoker Association and the St. Louis Oil Burner Association. Great credit is due them for their unselfish viewpoint.



DEPARTMENT OF PUBLIC SAFETY
DIVISION OF SMOKE REGULATION,
CITY OF SAINT LOUIS

ST. LOUIS, MO.,____________194__
*FEE ____________
*PERMIT NO. ____________
*CERTIFICATE NO. ____________

APPLICATION FOR PERMIT TO INSTALL WATER HEATER

At (Address)____________ Zone____________ Installation Date____________
Owner____________ Address____________ Zone____________
Manufacturer & Model No.____________
Capacity____________ Gals. per hour @____________ Degrees Temperature Rise____________
Burner (if other than hand fired)____________
Fuel____________ Stack Size and Height____________
Is water heater vented____________ Has relief valve been installed____________
Remarks____________
Send permit to____________ Address____________ Zone____________
Send Certificate to____________ Address____________ Zone____________
*Permit approved by____________ Date____________ Certificate approved by____________ Date____________
*Inspection made by____________ Date____________ *BU. Date____________
*Applicant, do not fill in these lines.
Signed____________

MAKE CHECKS PAYABLE TO
CITY OF ST. LOUIS

# MIST AND DUST COLLECTION IN INDUSTRY AND BUILDINGS

### *C. E. Lapple, du Pont Engineer, Reviews the Methods of Analyzing Dust Particles*

IN SEDIMENTATION analyses the dust particles are allowed to settle through a still fluid under the action of gravity or a centrifugal field. Sedimentation differs from elutriation in that in the former the fluid is at rest and the particles move through the fluid, while in the latter the fluid moves. In both methods, however, the relative motion between the particles and the fluid is the same. Consequently, the settling rate of the particles is in turn related to particle diameter by the same laws of motion as for elutriation and the particle size obtained from a sedimentation analysis is that of a sphere of the same density having the same settling velocity as the particle in question. Particle size analysis by sedimentation in still fluid is generally limited to sedimentation in liquids, where dispersion can be assured by use of the proper dispersion agent. Sedimentation in gases is not generally feasible since large particles fall too rapidly while fine ones tend to flocculate and cannot be maintained dispersed.

#### Liquid Sedimentation

Liquid sedimentation falls into two general categories. In the first, a liquid suspension of dust is introduced into the top of a column of clear liquid and the weight or volume of sediment at given time intervals is observed. The Werner (22)* and Palo-Travis apparatus (15, 21), shown in Fig. 1, are typical of this type. The apparatus is extremely simple to construct and operate.

The chief objections to this method are that it is more difficult to insure continued dispersion of the dust than where uniform dispersions are employed; that large eddy currents are set up by the mixing of the dust suspension with the clear liquid; and that all the solids must be allowed to settle out before a size distribution can be calculated. As a result, this type of apparatus cannot be relied on to yield absolute particle size analyses in the range below 20 microns. However, its simplicity of operation makes it desirable for control analyses.

**"DUST IS ALL pervasive, everywhere, on land or sea . . . in all manufacturing processes; in the smoke from our furnaces." The problem of dust and mist control and collection is constantly receiving more attention and prominence, in order to eliminate nuisances, guard health and safety, reduce maintenance of equipment, recover valuable products, etc. . . . Mr. Lapple, of the design division, engineering department, E. I. du Pont de Nemours & Co., reviewed the purpose of mist and dust control and collection, and discussed the characteristics of mists and dusts, in the July 1944 HPAC. In August 1944 he considered the measurement and character of atmospheric pollution, and in October 1944 he wrote on sampling ventilation and process gases. In the November 1944 issue, he explained microscopic and elutriation analyses of dust, and in the present article he writes on sedimentation and miscellaneous methods of analysis, and compares the various ways of analyzing particle sizes.**

Most sedimentation methods fall into the second class, which deals with an initial uniform suspension of dust in the liquid. These can be split into three subdivisions: (a) those in which the total weight of solids between two levels, usually between the liquid surface and some point near the bottom of the sedimentation tube, is measured at various times after sedimentation has started; (b) those in which the solid concentration is measured at some point above the bottom of the tube at various times after the sedimentation has started; and (c) those in which the suspension is allowed to settle for a specified time, after which the liquid suspension is separated from the sediment by decantation.

All these methods yield a weight vs. time relationship. The cumulative particle size distribution (i.e., cumulative percentage of material larger or smaller than a specified size) can be calculated directly from the relationship obtained from the second and third groups. With the first group, however, it is necessary to draw tangents to the weight-time curve before the cumulative particle size distribution can be determined.

The Oden sedimentation balance method (2, 14) and the Wiegner method (24) are typical of the first group. In the Oden method, a counterweighted balance pan is suspended near the bottom of the sedimentation tube and the quantity of dust collected on the balance is recorded as a function of time. In the Weigner method, the pressure at a fixed level is measured as a function of time. The pressure change in any time interval can, in turn, be converted to mass of material that has settled out. The chief objection to the latter method is the difficulty of measuring the pressure with sufficient accuracy to detect the small pressure changes that take place during sedimentation.

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*Numbers in parentheses refer to the accompanying list of literature cited.

The following methods are typical of the second group, in which the concentration of solids at a given level is measured as the sedimentation progresses:

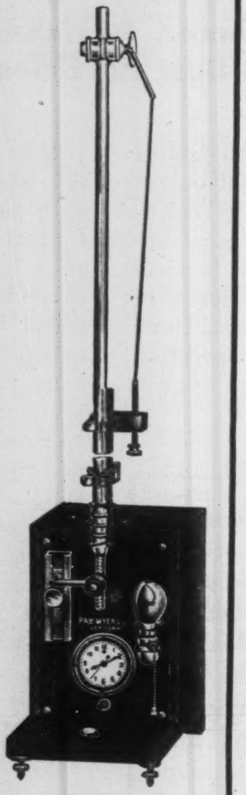

Fig. 1—Palo-Travis particle size apparatus (courtesy Palo-Myers, Inc.)

*Pressure Difference* (4, 12): A two-liquid differential manometer connected across a small incremental height of tube on either side of the specified level can be used to record the change in density or concentration at that level as a function of time. The chief objection to the method is the high degree of sensitivity required for the pressure difference measurement.

*Hydrometer* (10): The density or concentration at a given level is measured by inserting a hydrometer at a specified time. The level in this case corresponds substantially to the center of volume of the hydrometer. This method is rapid and simple. The objection to the method concerns the disturbance caused by inserting and withdrawing the hydrometer and the large proportion of the settling distance covered by the hydrometer bulb.

*Pipette Method* (8): In this, a sample is withdrawn from a given level by means of a pipette at specified time intervals and analyzed gravimetrically or otherwise for solids content. An apparatus in this category is that of Andreasen (1, 8, 11), shown in Fig. 2.

*Photometric:* The obstruction caused by the particles to a beam of light passing through the suspension at a given level can be measured by means of a photo-electric cell. This in turn can be converted to particle concentration. While this method is very simple and offers much promise, the underlying methods for converting light transmission to particle concentration are not understood well enough to permit reliable utilization of this method at present (9, 17).

Of the above methods, the pipette method of analysis is probably the most reliable, whereas the hydrometer method is probably the simplest, involving considerably less actual laboratory routine than the pipette method. Schweyer (17) and Russell and Weisz (16) report excellent agreement between the pipette and hydrometer methods. While the photometric method is still simpler than the hydrometer method, its present state of development does not permit its consideration for accurate analyses except in special cases where sufficient calibration data are available.

For practical considerations, the above sedimentation methods all require initial suspension concentrations of over 0.5 per cent solids. This has been raised as an objection on the grounds that the concentration is too great to permit free settling conditions, assumed in calculating the effective particle diameter, since the particles would be less than five diameters apart on the average. For this reason, Carey and Stairmand (3) developed a photographic sedimentation device in which the paths of fall of the individual particles are photographed and the particle size distribution is computed from the exposure times and by counting and classifying the path length. While this method utilizes concentrations on the order of 0.01 per cent solids and should be capable of a high degree of accuracy, the apparatus is quite elaborate and expensive.

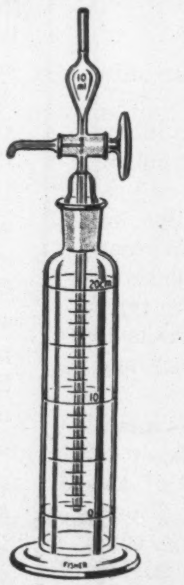

Fig. 2—Andreasen pipette apparatus (courtesy Fisher Scientific Co.)

A decantation method of sedimentation similar to that of Cummings (5) has been developed by Western Precipitation Corp. (23). In this, a suspension is allowed to settle for a specified time, whereupon the liquid above a fixed level is rapidly withdrawn. Sufficient liquid is then added to the remaining suspension to bring the volume to its original value, and the sediment is redispersed. This procedure is repeated from 15 to 30 times. The sediment remaining after the final decantation represents the material above a specified size, as determined by the settling time and the decantation level, while the solids filtered from all the decanted portions represent the material finer than this size.

All sedimentation methods usually require a dispersion agent, as do liquid elutriation methods. Failure to secure proper dust dispersions is probably the most frequent source of error and this phase should be carefully checked before making any analyses. A uniform temperature is another important requirement, particularly for analyses in the size range below 10 microns, since thermal eddy currents set up by slight temperature gradients can become large compared to the particle settling velocity. This factor is compensating to some extent, however.

Gravity sedimentation methods employing water are limited to a size range of 1 to 40 microns. The lower limit is determined by the pronounced effect of thermal eddy currents, Brownian movement, and colloidal tendencies with smaller particles, as well as the length of time required, while the upper limit is determined by the rapid settling rate of larger particles. The upper range can be extended to over 100 microns if a more viscous fluid, such as glycerol, is used as the suspension medium. The lower limit can be extended down to 0.05 micron by means of the centrifuge (13, 18). Svedberg (19, 20) developed the ultracentrifuge, which utilizes centrifugal forces as high as 75,000 times gravity, to extend the particle size range down to 0.001 micron, which is the range of large molecules. Dana (7) presents details on a centrifugal pipette method of analysis.

Schweyer and Work (18) and Heywood (9) present excellent reviews of sedimentation methods while Dalla Valle (6) and Martin (13) present the theory involved in sedimentation analyses.

### Miscellaneous Methods

Turbidimetric methods of analyses (18, 32, 33) have been used in order to determine particle size. It is only when used in conjunction with sedimentation that they yield particle size distribution. When used alone, they yield only a measure of the total particle surface. These methods are not yet understood completely enough to yield to direct analysis and hence require calibration. Measurements of both light scattering and transmission have been employed. The behavior of a beam of light as it passes through a suspension or dispersion depends on the wave length of light used as well as on the size, concentration, shape, and optical properties of the particles. Despite the inherent complexity, these methods offer a rapid means of particle size analysis and have been successfully employed for silica and cement, for which extensive data are available.

The permeability method (25, 29, 30) of analysis has recently received much prominence and is very simple and rapid. It depends on the measurement of the resistance of a bed of the dust to the flow of a liquid or gas and is capable of giving a measure of the total particle surface but cannot be used to give a size distribution. Permeability depends on the physical properties of the fluid used as well as on the particle size and shape and on the degree of packing of the bed, as measured by the void content. A commercial instrument for such a measurement has recently appeared on the market (26) and is shown in Fig. 3.

Considerable work has also been done on the adsorption of gas films on the surface of a powder as a means for measuring total particle surface (27, 31). These methods require elaborate analyses and are not capable of giving a particle size distribution.

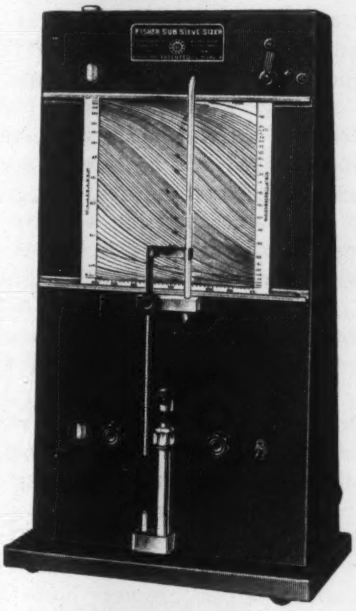

**Fig. 3—Permeability sub-sieve sizer (courtesy Fisher Scientific Co.)**

Numerous other principles or particle characteristics have been proposed for the measurement of particle size or total particle surface, among which are rate of solution, electron and x-ray diffraction, behavior of particles in an electrical field, fractionation by means of calibrated ultrafilters, heat of wetting, bulk density, hiding power, tinting power, and angle of repose. Most of these methods have not been studied thoroughly, require elaborate equipment, are limited to narrow particle size ranges, and yield only a measure of particle surface rather than a particle size distribution.

### Comparison of Particle Size Analysis Methods

In general, particle size analysis methods measure various properties of the particle, which are then converted to particle size in terms of certain theoretical, empirical, or arbitrary formulations. For regular simple shapes—such as spheres—these formulations can be devised fairly reliably. For the irregular particle shapes encountered in practice, however, it is not surprising that major discrepancies will exist when various methods of analysis are used on the same dust. Such discrepancies arise not only from difficulties in formulating the relations between particle size and the particular particle property measured, but also from difficulties in specifying just what is meant by particle size for irregular particles. Fig. 4 presents particle size data on two grades of flint as determined by various methods. The complex nature of the problem can be appreciated when it is realized that the flint used constitutes about as regular a shape of particle as can normally be expected in practice.

Schweyer [Chemical Review, 31, 295-317 (1942)] has given an excellent review of the various definitions used for particle size and the relationship between them. He also presents numerous data showing the comparison between the particle size as measured by various methods, including microscopic counts, pipette sedimentation, sieve analysis, and turbidimeter measurements. While it is impossible to draw any completely satisfactory generalizations due to the wide variety of shapes encountered in practice, a few guiding rules can be formulated. Sedimentation diameters generally range from 0.8 to 1.4 times the sieve diameter, averaging about 1.2, and from 0.5 to 0.9 times the microscopic diameters. In using such rules, however, it should be remembered that much wider variations are possible with particles of extremely irregular shapes, such as needles or flat plates. Schweyer also presents particle size and shape data on numerous types of dust and discusses their relationship to other particle properties such as particle surface and packing properties.

### Application to Dust Control

For dust control work, it is generally desirable to obtain particle size distribution analyses in the range of 1 to 100 microns. Larger particles are easily handled, while smaller ones are of interest in design only insofar as the total quantity or number of finer particles are concerned. Most dust control methods are concerned with the behavior or motion of a particle in a gas stream, as characterized by the settling rate of the particle. In this respect air elutriation yields a direct measure of that property of a particle which is of particular interest. While such an analysis is generally expressed in terms of particle size, it is inherently a measure of settling velocity. Even though air elutriation thus becomes a preferred method in dust control work, particle size analysis in the range below 10 microns becomes time-consuming and even impossible at times if a large percentage of the dust is smaller than 10 microns. Liquid sedimentation methods are considerably simpler and more reliable in the fine particle size range if proper techniques are employed. The results obtained from sedimentation methods can also be translated directly into equivalent gas settling velocities, with the exception of the case where porous or hollow particles are involved. Such particles are rarely encountered in the size range below 10 microns. Consequently, the pipette or hydrometer methods are to be recommended for most dust control work owing to their reliability and simplicity and the relatively inexpensive apparatus involved.

In connection with particle size analyses, it is generally necessary to know the true specific gravity (not bulk density) of the dust particles in question. This can often be found in standard reference sources. In some cases, however, it may be necessary to measure this property by means of a pycnometer or specific gravity bottle (28). When air elutriation is used, this property need not be known accurately in connection with dust control work since settling velocity is measured directly. It is, however, essential to know the specific gravity accurately where liquid sedimentation analyses are to be translated in terms of gas settling velocity. For this reason air elutriation is to be preferred for dust control work where the dust in question consists of a mixture of materials of various specific gravities.

Microscopic methods are satisfactory for relatively regular particles but such analyses are very laborious and are not always easily translated into terms of gas settling velocities if the particle shape is irregular. However, brief microscopic examination and visual estimates of particle size distribution are often all that is required for a specific design and should usually be resorted to before attempting a more accurate and detailed analysis. Where a large percentage (over 70 per cent) of a dust is coarser than 325 mesh, as can easily be judged with a little experience, a screen analysis is generally in order owing to its simplicity and rapidity. Particle size distribution in the subsieve range can then be determined with sufficient accuracy for many purposes by extrapolation on log-probability graph paper.

Where dust control involves filtration of dust by means of a suitable medium or fabric, the permeability of the dust is one of the primary considerations and a particle size distribution may not be required aside from an approximate knowledge of the particle size range involved.

In summary, it is recommended that, for dust control work, a qualitative microscopic examination or a screen analysis be made first. Pending the results of these tests, liquid sedimentation, air elutria-

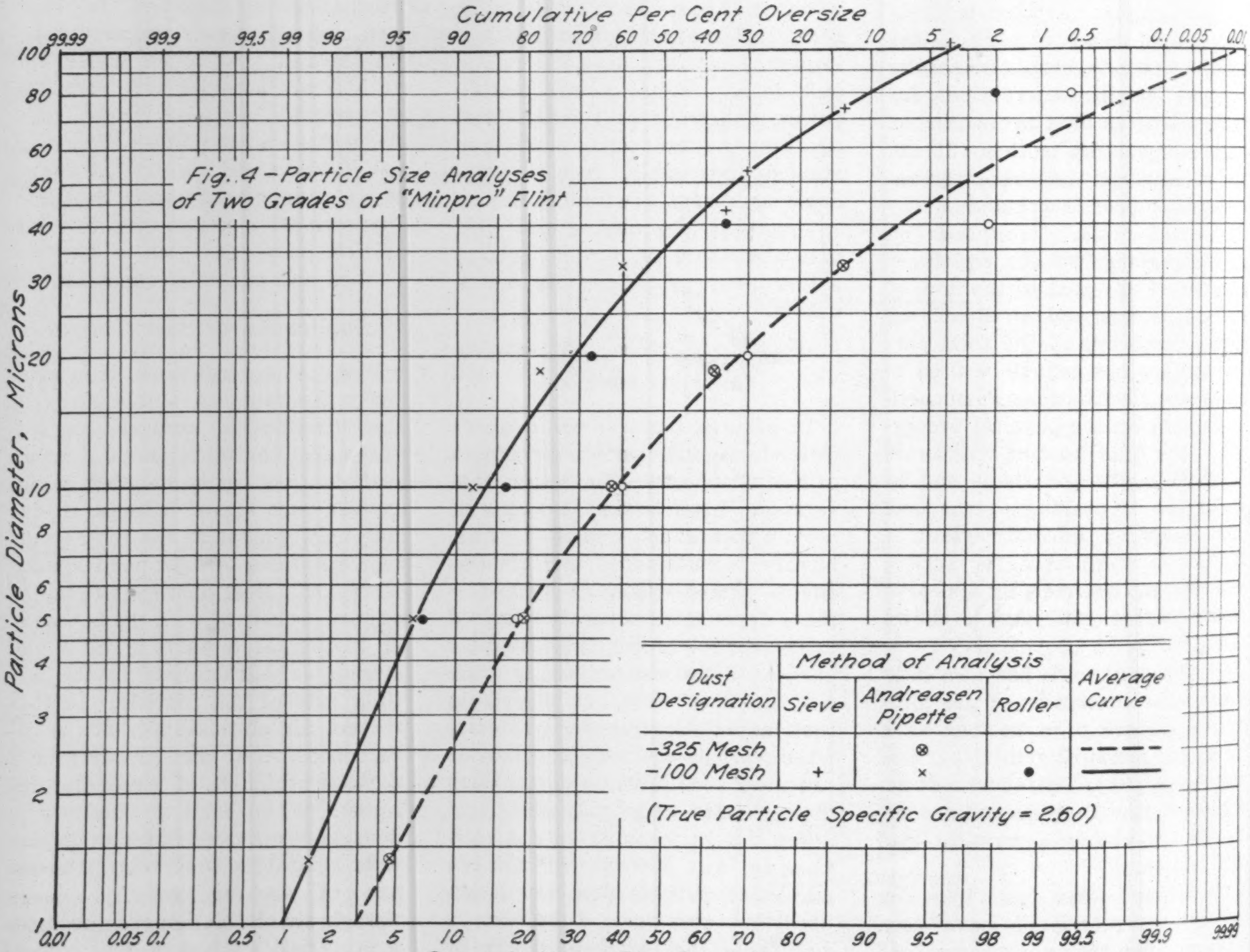

Fig. 4—Particle Size Analyses of Two Grades of "Minpro" Flint

tion, or permeability analyses can be resorted to for more detailed information regarding the required dust characteristics.

[Note: In Mr. Lapple's article in the November 1944 issue, a minor discrepancy exists in Fig. 1, p. 635. The point corresponding to 25 microns in the "count analysis" has been misplotted and should indicate 0.15 per cent oversize instead of 0.31 per cent as shown.]

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## REPORTS ON PALESTINE AIR CONDITIONING

Air conditioning in Palestine is still in its "early childhood," says Dr. B. S. Levin, of the Hebrew University, Jerusalem, in a recent letter to HPAC. He reports that the main three cities of Palestine—Jerusalem, Tel-Aviv and Haifa—possess a number of cinemas, some of which are air conditioned. There are only two air conditioned hotels, he says, the King David Hotel, Jerusalem, and the Kallia, at the Dead Sea.

Climatic conditions vary greatly. The plain and the coast have the regular subtropical climate, particularly humid along the coast. As far as Jerusalem is concerned, its climate is fairly cool, it rains heavily for five to six months a year, and the normal summer days are never unbearably hot, according to Dr. Levin. Around 4 p. m. when the sun begins to set, it is usually sufficiently cool for wearing a sweater or a tweed jacket. Jerusalem is situated in the hilly part of the country, some 2500 ft high, and has a very dry climate. Heat becomes unbearable only during the days when a hot wind is blowing from the desert, reducing humidity (which already is rather low in this region) to about 20 per cent of the normal. There is an average of about 30 days of this hot wind during the year.

The Dead Sea region and the valley of Tiberias have a regular tropical climate and, Dr. Levin presumes, should be greatly interested in air cooling appliances. Some attempts at air conditioning have been made there already.

Air conditioning and refrigeration markets in Palestine include hospitals and sanatoria and babies' homes and crèches, hotels and modern apartment houses, cold storage, fish transportation from the coast and the lake to the inland, cinemas, scientific laboratories, etc., Dr. Levin says.

## COMING NEXT MONTH

The Directory Section of Heating, Piping, and Air Conditioning Equipment for Industry and Large Buildings, for many years a feature of the January issue of HPAC, will be published next month. Watch for this complete, valuable, and extensive listing.

# COMPARATIVE ENGINEERING DATA ON REFRIGERANTS GIVEN IN NEW TABLES→

IN DECIDING which refrigerant to use under a specific set of conditions, tables are needed which give engineering data such as weight and volume of refrigerant to be circulated per ton, and horsepower and capacity. Such tables, in addition to the basic data on thermodynamic properties, are of value in showing at a glance just which refrigerant would be desirable under a given set of circumstances.

For this reason various sets of tables* have been prepared for "Freon"-11, -12, -21, -22, and -113, ammonia, methyl chloride, and water vapor. These tables enable the user to make rapid comparisons of the important basic data needed in deciding whether a refrigerant is suitable for a given set of circumstances. Temperatures are shown in degrees Fahrenheit.

The tables are easy to use. The temperature of the liquid ahead of the expansion valve is equal to the condensing temperature if no subcooling takes place. However, a small amount of subcooling usually takes place in most condensers. It is reasonably safe to figure that the temperature of the liquid ahead of the expansion valve will be about 5 F lower than the actual condensing temperature. The actual condensing temperature corresponding to any given head pressure can, of course, be found in the tables for saturated liquid.

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*See HPAC, June 1944, pp. 337-338, July 1944, p. 409, August 1944, pp. 478-480, October 1944, pp. 593-594, and May 1945 pp. 256-258.

## Industrial and Commercial Gas Conference to Be Held in Toledo

Harry A. Sutton, chairman of the industrial and commercial gas section, has announced that the 1946 American Gas Association conference on industrial and commercial gas will be held in Toledo, Ohio, March 28 and 29 at the Commodore Perry hotel.

A program for industrial and commercial gas men and appliance and equipment manufacturers is being planned by the program committee under the chairmanship of Ralph S. Wenner. The object of this conference is to aid the industrial and commercial branches of the gas industry in the continuance of their efforts to have the service rendered by the gas industry used most extensively and efficiently during the reconversion and postwar periods.

## Midwest Power Conference April 3, 4, and 5

After a year's lapse due to the war, the annual Midwest Power Conference will again be held in Chicago next April under the sponsorship of Illinois Institute of Technology, according to an announcement by Stanton E. Winston, conference chairman. The 1946 meeting has been enlarged to three full days, April 3, 4 and 5, with headquarters at the Palmer House, so that many recent and important developments in the power field may be included. Preliminary plans for the conference include, for the first time, a session on the gas turbine, which has assumed an increasingly important position in recent years due largely to wartime developments. Applications of atomic energy in the postwar power world will also be discussed by this group.

Other scheduled sessions include papers on industrial plants, hydro power, feedwater treatment, recent developments in the fields of heating and air conditioning, fuels and combustion, central station practice, industrial loads supply, diesel power, insulation problems on power systems, and recent electrical developments.

Chief highlights of the three day session will be an "All-Engineers" Dinner and joint luncheons with the ASME and AIEE.

Cooperating with Illinois Institute of Technology in the sponsorship of the 1946 conference are nine midwestern colleges and universities and several engineering societies, among which is the Illinois Chapter, ASHVE.

Professor Winston, who has recently been appointed director of the evening division at Illinois Tech, is director of the conference for the seventh consecutive year. Assisting him as conference secretary will be C. A. Nash, department of electrical engineering, Illinois Institute of Technology, 3300 Federal St., Chicago 16, Ill.

## Other Meetings

American Society of Heating and Ventilating Engineers, 52nd annual meeting, January 28-30, Hotel Commodore, New York City. Society secretary, A. V. Hutchinson, 51 Madison Ave., New York 10.

National Metal Congress and Exposition, February 4-8, Public Auditorium, Cleveland.

National Association of Corrosion Engineers, annual meeting; May 7-9, President hotel, Kansas City. Association headquarters, Southern Standards Building, 711 Main St., Houston 2, Tex.

National Marine Exposition; May 20-25, Grand Central Palace, New York City. Headquarters, National Marine Expositions, Inc., 17 Battery Pl., New York City.

American Society for Testing Materials, 49th annual meeting, June 24-26, Buffalo. Annual spring meeting, February 25 to March 1, Pittsburgh.

If you are planning to attend a meeting or convention, it is suggested that you write the headquarters office of the sponsoring society or group for a copy of the program, and information about hotel reservations, etc. The street addresses of the various societies are given above for this purpose. Sometimes the dates or complete plans for such meetings are changed, and it is well, before making your own arrangements, to check with those in charge of the affair to be sure that no such changes will affect your own schedule. The editors of Heating, Piping & Air Conditioning will be glad to forward your requests for more information to the various societies, if it is more convenient for you to write direct to us.

## "Freon-22"—Volume of refrigerant to be compressed
(*Saturated vapor leaving evaporator*)
**Cu ft per min per ton of refrigerating capacity**

| Evap Temp | Temperature of liquid ahead of expansion valve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -100 | -95 | -90 | -85 | -80 | -75 | -70 | -65 | -60 | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | - 5 | 0 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| -150 | 285 | 288 | 292 | 296 | 299 | 303 | 307 | 311 | 316 | 320 | 325 | 330 | 334 | 340 | 345 | 350 | 356 | 362 | 368 | 375 | 381 | 388 | 392 | 407 | 424 | 444 | 465 | 489 | 516 | 548 |
| -145 | 222 | 225 | 227 | 230 | 233 | 236 | 239 | 243 | 246 | 249 | 253 | 257 | 260 | 264 | 268 | 273 | 277 | 282 | 286 | 291 | 297 | 302 | 305 | 317 | 330 | 345 | 361 | 380 | 401 | 425 |
| -140 | 175 | 177 | 179 | 181 | 184 | 186 | 188 | 191 | 193 | 196 | 199 | 202 | 205 | 208 | 211 | 214 | 218 | 221 | 225 | 229 | 233 | 237 | 240 | 249 | 259 | 270 | 283 | 298 | 314 | 333 |
| -135 | 139 | 140 | 142 | 144 | 146 | 147 | 149 | 151 | 153 | 156 | 158 | 160 | 162 | 165 | 167 | 170 | 173 | 175 | 178 | 181 | 185 | 188 | 190 | 197 | 205 | 214 | 224 | 235 | 248 | 263 |
| -130 | 111 | 112 | 114 | 115 | 117 | 118 | 120 | 121 | 123 | 124 | 126 | 128 | 130 | 132 | 134 | 136 | 138 | 140 | 142 | 145 | 147 | 150 | 152 | 157 | 164 | 171 | 179 | 188 | 198 | 209 |
| -125 | 89.5 | 90.6 | 91.7 | 92.8 | 94.0 | 95.2 | 96.4 | 97.7 | 99.0 | 100 | 102 | 103 | 105 | 106 | 108 | 109 | 111 | 113 | 115 | 117 | 119 | 121 | 122 | 127 | 132 | 137 | 144 | 151 | 159 | 168 |
| -120 | 72.7 | 73.6 | 74.5 | 75.4 | 76.4 | 77.3 | 78.3 | 79.3 | 80.4 | 81.5 | 82.6 | 83.8 | 84.9 | 86.2 | 87.5 | 88.8 | 90.2 | 91.6 | 93.1 | 94.7 | 96.3 | 98.0 | 99.0 | 103 | 107 | 111 | 116 | 122 | 128 | 136 |
| -115 | 59.6 | 60.3 | 61.0 | 61.7 | 62.5 | 63.3 | 64.1 | 64.9 | 65.8 | 66.7 | 67.6 | 68.5 | 69.5 | 70.5 | 71.5 | 72.6 | 73.7 | 74.9 | 76.1 | 77.4 | 78.7 | 80.1 | 80.8 | 83.8 | 87.1 | 90.8 | 94.9 | 99.5 | 105 | 111 |
| -110 | 49.1 | 49.7 | 50.2 | 50.9 | 51.5 | 52.1 | 52.8 | 53.5 | 54.2 | 54.9 | 55.6 | 56.4 | 57.2 | 58.0 | 58.9 | 59.8 | 60.7 | 61.6 | 62.6 | 63.7 | 64.7 | 65.9 | 66.5 | 68.9 | 71.6 | 74.6 | 78.0 | 81.7 | 85.9 | 90.8 |
| -105 | 40.7 | 41.2 | 41.7 | 42.2 | 42.7 | 43.2 | 43.8 | 44.3 | 44.9 | 45.5 | 46.1 | 46.7 | 47.4 | 48.1 | 48.8 | 49.5 | 50.3 | 51.0 | 51.9 | 52.7 | 53.6 | 54.5 | 55.0 | 57.0 | 59.2 | 61.7 | 64.5 | 67.5 | 71.0 | 74.9 |
| -100 | 34.0 | 34.4 | 34.8 | 35.2 | 35.6 | 36.0 | 36.5 | 37.0 | 37.4 | 37.9 | 38.5 | 39.0 | 39.5 | 40.1 | 40.7 | 41.3 | 41.9 | 42.5 | 43.2 | 43.9 | 44.6 | 45.4 | 45.8 | 47.5 | 49.3 | 51.4 | 53.6 | 56.1 | 59.0 | 62.2 |
| - 95 | 28.5 | 28.8 | 29.2 | 29.5 | 29.9 | 30.2 | 30.6 | 31.0 | 31.4 | 31.8 | 32.2 | 32.7 | 33.1 | 33.6 | 34.1 | 34.6 | 35.1 | 35.6 | 36.2 | 36.8 | 37.4 | 38.0 | 38.4 | 39.8 | 41.3 | 43.0 | 44.8 | 46.9 | 49.3 | 52.0 |
| - 90 | 24.1 | 24.3 | 24.6 | 24.9 | 25.2 | 25.5 | 25.8 | 26.2 | 26.5 | 26.8 | 27.2 | 27.6 | 27.9 | 28.3 | 28.7 | 29.2 | 29.6 | 30.0 | 30.5 | 31.0 | 31.5 | 32.0 | 32.3 | 33.5 | 34.8 | 36.2 | 37.7 | 39.5 | 41.4 | 43.7 |
| - 85 | 20.4 | 20.6 | 20.9 | 21.1 | 21.4 | 21.6 | 21.9 | 22.2 | 22.5 | 22.7 | 23.1 | 23.4 | 23.7 | 24.0 | 24.3 | 24.7 | 25.1 | 25.5 | 25.9 | 26.3 | 26.7 | 27.1 | 27.4 | 28.3 | 29.4 | 30.6 | 31.9 | 33.4 | 35.0 | 36.9 |
| - 80 | 17.4 | 17.6 | 17.8 | 18.0 | 18.2 | 18.4 | 18.7 | 18.9 | 19.1 | 19.4 | 19.6 | 19.9 | 20.2 | 20.5 | 20.7 | 21.0 | 21.3 | 21.7 | 22.0 | 22.4 | 22.7 | 23.1 | 23.3 | 24.1 | 25.0 | 26.0 | 27.1 | 28.4 | 29.7 | 31.3 |
| - 75 | 14.9 | 15.1 | 15.2 | 15.4 | 15.6 | 15.8 | 16.0 | 16.2 | 16.4 | 16.6 | 16.8 | 17.0 | 17.3 | 17.5 | 17.7 | 18.0 | 18.3 | 18.5 | 18.8 | 19.1 | 19.4 | 19.8 | 19.9 | 20.6 | 21.4 | 22.2 | 23.2 | 24.2 | 25.4 | 26.7 |
| - 70 | 12.8 | 13.0 | 13.1 | 13.3 | 13.4 | 13.6 | 13.8 | 13.9 | 14.1 | 14.3 | 14.5 | 14.7 | 14.8 | 15.1 | 15.3 | 15.5 | 15.7 | 15.9 | 16.2 | 16.4 | 16.7 | 17.0 | 17.1 | 17.7 | 18.4 | 19.1 | 19.9 | 20.8 | 21.8 | 22.9 |
| - 65 | 11.1 | 11.2 | 11.3 | 11.5 | 11.6 | 11.7 | 11.9 | 12.0 | 12.2 | 12.3 | 12.5 | 12.7 | 12.8 | 13.0 | 13.2 | 13.4 | 13.6 | 13.8 | 14.0 | 14.2 | 14.4 | 14.6 | 14.8 | 15.3 | 15.8 | 16.4 | 17.1 | 17.9 | 18.7 | 19.7 |
| - 60 | 9.62 | 9.73 | 9.84 | 9.95 | 10.1 | 10.2 | 10.3 | 10.4 | 10.6 | 10.7 | 10.8 | 11.0 | 11.1 | 11.3 | 11.4 | 11.6 | 11.8 | 11.9 | 12.1 | 12.3 | 12.5 | 12.7 | 12.8 | 13.2 | 13.7 | 14.2 | 14.8 | 15.5 | 16.2 | 17.0 |
| - 55 | 8.38 | 8.47 | 8.57 | 8.66 | 8.76 | 8.86 | 8.97 | 9.08 | 9.19 | 9.30 | 9.42 | 9.55 | 9.67 | 9.80 | 9.93 | 10.1 | 10.2 | 10.4 | 10.5 | 10.7 | 10.8 | 11.0 | 11.1 | 11.5 | 11.9 | 12.4 | 12.9 | 13.4 | 14.1 | 14.8 |
| - 50 | 7.33 | 7.41 | 7.49 | 7.57 | 7.66 | 7.75 | 7.84 | 7.94 | 8.03 | 8.13 | 8.24 | 8.34 | 8.45 | 8.56 | 8.68 | 8.80 | 8.93 | 9.06 | 9.19 | 9.33 | 9.47 | 9.63 | 9.71 | 10.0 | 10.4 | 10.8 | 11.2 | 11.7 | 12.3 | 12.9 |
| - 45 | 6.44 | 6.51 | 6.58 | 6.65 | 6.73 | 6.81 | 6.89 | 6.97 | 7.05 | 7.14 | 7.23 | 7.32 | 7.42 | 7.52 | 7.62 | 7.72 | 7.83 | 7.94 | 8.06 | 8.18 | 8.31 | 8.44 | 8.51 | 8.80 | 9.11 | 9.45 | 9.83 | 10.3 | 10.7 | 11.3 |
| - 40 | 5.67 | 5.73 | 5.79 | 5.86 | 5.92 | 5.99 | 6.06 | 6.14 | 6.21 | 6.29 | 6.36 | 6.44 | 6.53 | 6.61 | 6.70 | 6.79 | 6.89 | 6.99 | 7.09 | 7.20 | 7.31 | 7.42 | 7.49 | 7.73 | 8.00 | 8.30 | 8.64 | 9.00 | 9.41 | 9.88 |
| - 35 | 5.01 | 5.06 | 5.12 | 5.18 | 5.23 | 5.29 | 5.36 | 5.42 | 5.48 | 5.55 | 5.62 | 5.69 | 5.76 | 5.84 | 5.92 | 6.00 | 6.08 | 6.17 | 6.26 | 6.35 | 6.45 | 6.55 | 6.60 | 6.82 | 7.06 | 7.32 | 7.61 | 7.93 | 8.29 | 8.69 |
| - 30 | 4.44 | 4.49 | 4.54 | 4.59 | 4.64 | 4.69 | 4.74 | 4.80 | 4.86 | 4.92 | 4.98 | 5.04 | 5.10 | 5.17 | 5.24 | 5.31 | 5.38 | 5.46 | 5.54 | 5.62 | 5.71 | 5.79 | 5.84 | 6.03 | 6.24 | 6.47 | 6.73 | 7.01 | 7.32 | 7.68 |
| - 25 | 3.95 | 3.99 | 4.03 | 4.08 | 4.12 | 4.17 | 4.22 | 4.27 | 4.32 | 4.37 | 4.42 | 4.48 | 4.53 | 4.59 | 4.65 | 4.72 | 4.78 | 4.85 | 4.92 | 4.99 | 5.07 | 5.14 | 5.19 | 5.35 | 5.54 | 5.74 | 5.97 | 6.21 | 6.49 | 6.80 |
| - 20 | 3.52 | 3.56 | 3.59 | 3.63 | 3.67 | 3.71 | 3.76 | 3.80 | 3.84 | 3.89 | 3.94 | 3.99 | 4.04 | 4.09 | 4.14 | 4.20 | 4.26 | 4.32 | 4.38 | 4.44 | 4.51 | 4.58 | 4.62 | 4.76 | 4.93 | 5.11 | 5.30 | 5.52 | 5.77 | 6.04 |
| - 15 | 3.14 | 3.18 | 3.21 | 3.25 | 3.28 | 3.32 | 3.36 | 3.40 | 3.44 | 3.48 | 3.52 | 3.56 | 3.61 | 3.65 | 3.70 | 3.75 | 3.80 | 3.85 | 3.91 | 3.97 | 4.02 | 4.09 | 4.12 | 4.25 | 4.39 | 4.55 | 4.73 | 4.92 | 5.14 | 5.38 |
| - 10 | 2.82 | 2.85 | 2.88 | 2.91 | 2.94 | 2.97 | 3.01 | 3.04 | 3.08 | 3.11 | 3.15 | 3.19 | 3.23 | 3.27 | 3.31 | 3.36 | 3.40 | 3.45 | 3.50 | 3.55 | 3.60 | 3.66 | 3.69 | 3.80 | 3.93 | 4.07 | 4.23 | 4.40 | 4.59 | 4.81 |
| - 5 | 2.53 | 2.56 | 2.58 | 2.61 | 2.64 | 2.67 | 2.70 | 2.73 | 2.76 | 2.80 | 2.83 | 2.86 | 2.90 | 2.94 | 2.97 | 3.01 | 3.05 | 3.10 | 3.14 | 3.18 | 3.23 | 3.28 | 3.31 | 3.41 | 3.52 | 3.65 | 3.79 | 3.94 | 4.11 | 4.30 |

## "Freon-22"—Weight of refrigerant to be circulated
(*Saturated vapor leaving evaporator*)
**Lb per min per ton of refrigerating capacity**

| Evap Temp | Temperature of liquid ahead of expansion valve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -100 | -95 | -90 | -85 | -80 | -75 | -70 | -65 | -60 | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | 5 | 0 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| -150 | 1.95 | 1.97 | 2.00 | 2.02 | 2.05 | 2.08 | 2.10 | 2.13 | 2.16 | 2.19 | 2.22 | 2.26 | 2.29 | 2.32 | 2.36 | 2.40 | 2.44 | 2.48 | 2.52 | 2.56 | 2.61 | 2.66 | 2.69 | 2.79 | 2.91 | 3.04 | 3.18 | 3.35 | 3.54 | 3.75 |
| -145 | 1.94 | 1.96 | 1.99 | 2.01 | 2.04 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.21 | 2.24 | 2.27 | 2.31 | 2.34 | 2.38 | 2.42 | 2.46 | 2.50 | 2.54 | 2.59 | 2.64 | 2.66 | 2.77 | 2.88 | 3.01 | 3.15 | 3.32 | 3.50 | 3.71 |
| -140 | 1.93 | 1.95 | 1.98 | 2.00 | 2.03 | 2.05 | 2.08 | 2.11 | 2.13 | 2.16 | 2.19 | 2.23 | 2.26 | 2.29 | 2.33 | 2.36 | 2.40 | 2.44 | 2.48 | 2.53 | 2.57 | 2.62 | 2.64 | 2.74 | 2.86 | 2.98 | 3.12 | 3.28 | 3.46 | 3.67 |
| -135 | 1.92 | 1.94 | 1.96 | 1.99 | 2.01 | 2.04 | 2.07 | 2.09 | 2.12 | 2.15 | 2.18 | 2.21 | 2.24 | 2.28 | 2.31 | 2.35 | 2.39 | 2.42 | 2.47 | 2.51 | 2.55 | 2.60 | 2.62 | 2.72 | 2.83 | 2.96 | 3.10 | 3.25 | 3.43 | 3.63 |
| -130 | 1.91 | 1.93 | 1.95 | 1.98 | 2.00 | 2.03 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.23 | 2.26 | 2.30 | 2.33 | 2.37 | 2.41 | 2.45 | 2.49 | 2.53 | 2.58 | 2.60 | 2.70 | 2.81 | 2.93 | 3.07 | 3.22 | 3.39 | 3.59 |
| -125 | 1.90 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.04 | 2.07 | 2.10 | 2.12 | 2.15 | 2.18 | 2.22 | 2.25 | 2.28 | 2.32 | 2.35 | 2.39 | 2.43 | 2.47 | 2.51 | 2.56 | 2.58 | 2.68 | 2.79 | 2.91 | 3.04 | 3.19 | 3.36 | 3.56 |
| -120 | 1.88 | 1.91 | 1.93 | 1.95 | 1.98 | 2.00 | 2.03 | 2.06 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.23 | 2.27 | 2.30 | 2.34 | 2.37 | 2.41 | 2.45 | 2.50 | 2.54 | 2.56 | 2.66 | 2.76 | 2.88 | 3.01 | 3.16 | 3.33 | 3.52 |
| -115 | 1.87 | 1.90 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.04 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.22 | 2.25 | 2.29 | 2.32 | 2.36 | 2.40 | 2.44 | 2.48 | 2.52 | 2.54 | 2.64 | 2.74 | 2.86 | 2.99 | 3.13 | 3.30 | 3.48 |
| -110 | 1.86 | 1.89 | 1.91 | 1.93 | 1.96 | 1.98 | 2.00 | 2.03 | 2.06 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.24 | 2.27 | 2.30 | 2.34 | 2.38 | 2.42 | 2.46 | 2.50 | 2.53 | 2.62 | 2.72 | 2.83 | 2.96 | 3.10 | 3.26 | 3.45 |
| -105 | 1.85 | 1.88 | 1.90 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.04 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.22 | 2.25 | 2.29 | 2.32 | 2.36 | 2.40 | 2.44 | 2.48 | 2.51 | 2.60 | 2.70 | 2.81 | 2.94 | 3.08 | 3.23 | 3.41 |
| -100 | 1.84 | 1.86 | 1.89 | 1.91 | 1.93 | 1.96 | 1.98 | 2.01 | 2.03 | 2.06 | 2.09 | 2.12 | 2.14 | 2.17 | 2.21 | 2.24 | 2.27 | 2.31 | 2.35 | 2.38 | 2.42 | 2.46 | 2.49 | 2.58 | 2.68 | 2.79 | 2.91 | 3.05 | 3.20 | 3.38 |
| - 95 | 1.83 | 1.85 | 1.88 | 1.90 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.05 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.22 | 2.26 | 2.29 | 2.33 | 2.37 | 2.40 | 2.45 | 2.47 | 2.56 | 2.65 | 2.76 | 2.88 | 3.02 | 3.17 | 3.34 |
| - 90 | 1.82 | 1.84 | 1.87 | 1.89 | 1.91 | 1.93 | 1.96 | 1.98 | 2.01 | 2.03 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.21 | 2.24 | 2.28 | 2.31 | 2.35 | 2.39 | 2.43 | 2.45 | 2.54 | 2.63 | 2.74 | 2.86 | 2.99 | 3.14 | 3.31 |
| - 85 | 1.81 | 1.83 | 1.86 | 1.88 | 1.90 | 1.92 | 1.95 | 1.97 | 2.00 | 2.02 | 2.05 | 2.08 | 2.10 | 2.13 | 2.16 | 2.19 | 2.23 | 2.26 | 2.30 | 2.33 | 2.37 | 2.41 | 2.43 | 2.52 | 2.61 | 2.72 | 2.84 | 2.97 | 3.11 | 3.28 |
| - 80 | 1.80 | 1.82 | 1.84 | 1.87 | 1.89 | 1.91 | 1.94 | 1.96 | 1.98 | 2.01 | 2.04 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.21 | 2.25 | 2.28 | 2.32 | 2.35 | 2.39 | 2.42 | 2.50 | 2.59 | 2.70 | 2.81 | 2.94 | 3.08 | 3.25 |
| -75 | 1.79 | 1.81 | 1.83 | 1.86 | 1.88 | 1.90 | 1.92 | 1.95 | 1.97 | 2.00 | 2.02 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.23 | 2.27 | 2.30 | 2.34 | 2.38 | 2.40 | 2.48 | 2.57 | 2.67 | 2.79 | 2.91 | 3.05 | 3.22 |
| -70 | 1.78 | 1.80 | 1.82 | 1.85 | 1.87 | 1.89 | 1.91 | 1.94 | 1.96 | 1.98 | 2.01 | 2.04 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.22 | 2.25 | 2.29 | 2.32 | 2.36 | 2.38 | 2.46 | 2.55 | 2.65 | 2.76 | 2.89 | 3.03 | 3.18 |
| -65 | 1.77 | 1.79 | 1.81 | 1.84 | 1.86 | 1.88 | 1.90 | 1.92 | 1.95 | 1.97 | 2.00 | 2.03 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.24 | 2.27 | 2.31 | 2.34 | 2.36 | 2.44 | 2.53 | 2.63 | 2.74 | 2.86 | 3.00 | 3.15 |
| -60 | 1.76 | 1.78 | 1.81 | 1.83 | 1.85 | 1.87 | 1.89 | 1.91 | 1.94 | 1.96 | 1.99 | 2.01 | 2.04 | 2.07 | 2.10 | 2.12 | 2.16 | 2.19 | 2.22 | 2.25 | 2.29 | 2.33 | 2.35 | 2.43 | 2.51 | 2.61 | 2.72 | 2.84 | 2.97 | 3.12 |
| -55 | 1.76 | 1.78 | 1.80 | 1.82 | 1.84 | 1.86 | 1.88 | 1.90 | 1.93 | 1.95 | 1.98 | 2.00 | 2.03 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.21 | 2.24 | 2.27 | 2.31 | 2.33 | 2.41 | 2.50 | 2.59 | 2.70 | 2.82 | 2.95 | 3.10 |
| -50 | 1.75 | 1.77 | 1.79 | 1.81 | 1.83 | 1.85 | 1.87 | 1.89 | 1.92 | 1.94 | 1.96 | 1.99 | 2.01 | 2.04 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.22 | 2.26 | 2.29 | 2.31 | 2.39 | 2.48 | 2.57 | 2.68 | 2.79 | 2.92 | 3.07 |
| -45 | 1.74 | 1.76 | 1.78 | 1.80 | 1.82 | 1.84 | 1.86 | 1.88 | 1.90 | 1.93 | 1.95 | 1.98 | 2.00 | 2.03 | 2.06 | 2.09 | 2.11 | 2.14 | 2.18 | 2.21 | 2.24 | 2.28 | 2.30 | 2.38 | 2.46 | 2.55 | 2.65 | 2.77 | 2.90 | 3.04 |
| -40 | 1.73 | 1.75 | 1.77 | 1.79 | 1.81 | 1.83 | 1.85 | 1.87 | 1.89 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.04 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.23 | 2.26 | 2.28 | 2.36 | 2.44 | 2.53 | 2.63 | 2.75 | 2.87 | 3.01 |
| -35 | 1.72 | 1.74 | 1.76 | 1.78 | 1.80 | 1.82 | 1.84 | 1.86 | 1.88 | 1.91 | 1.93 | 1.95 | 1.98 | 2.01 | 2.03 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.21 | 2.25 | 2.27 | 2.34 | 2.42 | 2.51 | 2.61 | 2.72 | 2.85 | 2.99 |
| -30 | 1.71 | 1.73 | 1.75 | 1.77 | 1.79 | 1.81 | 1.83 | 1.85 | 1.87 | 1.90 | 1.92 | 1.94 | 1.97 | 1.99 | 2.02 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.20 | 2.23 | 2.25 | 2.33 | 2.41 | 2.50 | 2.59 | 2.70 | 2.82 | 2.96 |
| -25 | 1.70 | 1.72 | 1.74 | 1.76 | 1.78 | 1.80 | 1.82 | 1.84 | 1.86 | 1.89 | 1.91 | 1.93 | 1.96 | 1.98 | 2.01 | 2.04 | 2.06 | 2.09 | 2.12 | 2.15 | 2.19 | 2.22 | 2.24 | 2.31 | 2.39 | 2.48 | 2.57 | 2.68 | 2.80 | 2.94 |
| -20 | 1.69 | 1.71 | 1.73 | 1.75 | 1.77 | 1.79 | 1.81 | 1.83 | 1.85 | 1.88 | 1.90 | 1.92 | 1.95 | 1.97 | 2.00 | 2.03 | 2.05 | 2.08 | 2.11 | 2.14 | 2.17 | 2.21 | 2.22 | 2.30 | 2.37 | 2.46 | 2.56 | 2.66 | 2.78 | 2.91 |
| -15 | 1.69 | 1.70 | 1.72 | 1.74 | 1.76 | 1.78 | 1.80 | 1.82 | 1.84 | 1.86 | 1.89 | 1.91 | 1.94 | 1.96 | 1.99 | 2.01 | 2.04 | 2.07 | 2.10 | 2.13 | 2.16 | 2.19 | 2.21 | 2.28 | 2.36 | 2.44 | 2.54 | 2.64 | 2.76 | 2.89 |
| -10 | 1.68 | 1.70 | 1.71 | 1.73 | 1.75 | 1.77 | 1.79 | 1.81 | 1.83 | 1.86 | 1.88 | 1.90 | 1.92 | 1.95 | 1.97 | 2.00 | 2.03 | 2.06 | 2.09 | 2.12 | 2.15 | 2.18 | 2.20 | 2.27 | 2.34 | 2.43 | 2.52 | 2.62 | 2.74 | 2.86 |
| - 5 | 1.67 | 1.69 | 1.71 | 1.72 | 1.74 | 1.76 | 1.78 | 1.80 | 1.82 | 1.85 | 1.87 | 1.89 | 1.91 | 1.94 | 1.96 | 1.99 | 2.02 | 2.04 | 2.07 | 2.10 | 2.13 | 2.17 | 2.18 | 2.25 | 2.33 | 2.41 | 2.50 | 2.60 | 2.71 | 2.84 |

## "Freon-22"—Theoretical capacity of refrigerating compressors
(*Saturated vapor leaving evaporator*)
Tons per cu ft per min of vapor compressed

| Evap Temp | Temperature of liquid ahead of expansion valve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -100 | -95 | -90 | -85 | -80 | -75 | -70 | -65 | -60 | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| -150 | 0.00351 | 0.00347 | 0.00343 | 0.00338 | 0.00334 | 0.00330 | 0.00325 | 0.00321 | 0.00317 | 0.00312 | 0.00308 | 0.00303 | 0.00299 | 0.00295 | 0.00290 | 0.00285 | 0.00281 | 0.00276 | 0.00272 | 0.00267 | 0.00262 | 0.00258 | 0.00255 | 0.00245 | 0.00236 | 0.00225 | 0.00215 | 0.00204 | 0.00194 | 0.00182 |
| -145 | .00450 | .00445 | .00440 | .00434 | .00429 | .00423 | .00418 | .00412 | .00406 | .00401 | .00395 | .00390 | .00384 | .00378 | .00372 | .00367 | .00361 | .00355 | .00349 | .00343 | .00337 | .00331 | .00328 | .00316 | .00303 | .00290 | .00277 | .00263 | .00250 | .00235 |
| -140 | .00572 | .00566 | .00559 | .00552 | .00545 | .00538 | .00531 | .00524 | .00517 | .00510 | .00503 | .00496 | .00489 | .00481 | .00474 | .00467 | .00459 | .00452 | .00444 | .00437 | .00429 | .00422 | .00418 | .00402 | .00386 | .00370 | .00353 | .00336 | .00319 | .00300 |
| -135 | .00722 | .00713 | .00704 | .00695 | .00687 | .00678 | .00669 | .00660 | .00652 | .00643 | .00634 | .00625 | .00616 | .00607 | .00598 | .00589 | .00579 | .00570 | .00561 | .00551 | .00542 | .00532 | .00527 | .00508 | .00488 | .00467 | .00446 | .00425 | .00403 | .00381 |
| -130 | .00901 | .00890 | .00880 | .00869 | .00858 | .00847 | .00837 | .00826 | .00815 | .00804 | .00792 | .00782 | .00770 | .00759 | .00748 | .00736 | .00725 | .00713 | .00702 | .00690 | .00678 | .00667 | .00660 | .00636 | .00611 | .00586 | .00560 | .00533 | .00506 | .00478 |
| -125 | 0.0112 | 0.0110 | 0.0109 | 0.0108 | 0.0106 | 0.0105 | 0.0104 | 0.0102 | 0.0101 | 0.00997 | 0.00983 | 0.00970 | 0.00956 | 0.00942 | 0.00929 | 0.00914 | 0.00900 | 0.00886 | 0.00871 | 0.00857 | 0.00842 | 0.00828 | 0.00820 | 0.00791 | 0.00760 | 0.00728 | 0.00696 | 0.00664 | 0.00630 | 0.00595 |
| -120 | .0137 | .0136 | .0134 | .0133 | .0131 | .0129 | .0128 | .0126 | .0124 | .0123 | .0121 | .0119 | .0118 | .0116 | .0114 | .0113 | .0111 | .0109 | .0107 | .0106 | .0104 | .0102 | .0101 | .00975 | .00937 | .00898 | .00860 | .00819 | .00778 | .00736 |
| -115 | .0168 | .0166 | .0164 | .0162 | .0160 | .0158 | .0156 | .0154 | .0152 | .0150 | .0148 | .0146 | .0144 | .0142 | .0140 | .0138 | .0136 | .0134 | .0131 | .0129 | .0127 | .0125 | .0124 | .0119 | .0115 | .0110 | .0105 | .0100 | .00955 | .00903 |
| -110 | .0204 | .0201 | .0199 | .0197 | .0194 | .0192 | .0189 | .0187 | .0185 | .0182 | .0180 | .0177 | .0175 | .0172 | .0170 | .0167 | .0165 | .0162 | .0160 | .0157 | .0155 | .0152 | .0150 | .0145 | .0140 | .0134 | .0128 | .0122 | .0116 | .0110 |
| -105 | .0246 | .0243 | .0240 | .0237 | .0234 | .0231 | .0229 | .0226 | .0223 | .0220 | .0217 | .0214 | .0211 | .0208 | .0205 | .0202 | .0199 | .0196 | .0193 | .0190 | .0187 | .0183 | .0182 | .0175 | .0169 | .0162 | .0155 | .0148 | .0141 | .0133 |
| -100 | 0.0294 | 0.0291 | 0.0288 | 0.0284 | 0.0281 | 0.0277 | 0.0274 | 0.0271 | 0.0267 | 0.0264 | 0.0260 | 0.0257 | 0.0253 | 0.0250 | 0.0246 | 0.0242 | 0.0239 | 0.0235 | 0.0231 | 0.0228 | 0.0224 | 0.0220 | 0.0218 | 0.0211 | 0.0203 | 0.0195 | 0.0187 | 0.0178 | 0.0170 | 0.0161 |
| - 95 | .0351 | .0347 | .0343 | .0339 | .0335 | .0331 | .0327 | .0323 | .0319 | .0314 | .0310 | .0306 | .0302 | .0298 | .0294 | .0289 | .0285 | .0281 | .0276 | .0272 | .0268 | .0263 | .0261 | .0252 | .0242 | .0233 | .0223 | .0213 | .0203 | .0192 |
| - 90 | .0416 | .0411 | .0406 | .0401 | .0397 | .0392 | .0387 | .0382 | .0378 | .0373 | .0368 | .0363 | .0358 | .0353 | .0348 | .0343 | .0338 | .0333 | .0328 | .0323 | .0317 | .0312 | .0309 | .0299 | .0288 | .0276 | .0265 | .0253 | .0241 | .0229 |
| - 85 | .0490 | .0484 | .0479 | .0473 | .0468 | .0462 | .0456 | .0451 | .0445 | .0440 | .0434 | .0428 | .0422 | .0416 | .0411 | .0405 | .0399 | .0393 | .0387 | .0381 | .0375 | .0368 | .0365 | .0353 | .0340 | .0327 | .0313 | .0300 | .0286 | .0271 |
| - 80 | .0575 | .0568 | .0562 | .0555 | .0549 | .0542 | .0536 | .0529 | .0522 | .0516 | .0509 | .0503 | .0496 | .0489 | .0482 | .0475 | .0468 | .0461 | .0454 | .0447 | .0440 | .0433 | .0429 | .0415 | .0400 | .0384 | .0369 | .0353 | .0336 | .0319 |
| - 75 | 0.0671 | 0.0663 | 0.0656 | 0.0648 | 0.0641 | 0.0633 | 0.0625 | 0.0618 | 0.0610 | 0.0602 | 0.0595 | 0.0587 | 0.0579 | 0.0571 | 0.0563 | 0.0556 | 0.0547 | 0.0539 | 0.0531 | 0.0523 | 0.0515 | 0.0506 | 0.0502 | 0.0485 | 0.0468 | 0.0450 | 0.0432 | 0.0413 | 0.0394 | 0.0374 |
| - 70 | .0779 | .0770 | .0762 | .0754 | .0745 | .0736 | .0727 | .0718 | .0709 | .0700 | .0692 | .0683 | .0673 | .0664 | .0655 | .0646 | .0637 | .0627 | .0618 | .0609 | .0599 | .0589 | .0584 | .0565 | .0545 | .0524 | .0503 | .0481 | .0459 | .0437 |
| - 65 | .0902 | .0892 | .0882 | .0872 | .0862 | .0852 | .0842 | .0831 | .0821 | .0811 | .0801 | .0791 | .0780 | .0769 | .0759 | .0748 | .0737 | .0727 | .0716 | .0705 | .0694 | .0683 | .0677 | .0654 | .0632 | .0608 | .0584 | .0559 | .0534 | .0507 |
| - 60 | .104 | .103 | .102 | .100 | .0993 | .0981 | .0970 | .0959 | .0947 | .0935 | .0923 | .0912 | .0899 | .0887 | .0876 | .0864 | .0851 | .0839 | .0826 | .0814 | .0801 | .0789 | .0781 | .0756 | .0730 | .0702 | .0675 | .0646 | .0617 | .0587 |
| - 55 | .119 | .118 | .117 | .115 | .114 | .113 | .111 | .110 | .109 | .107 | .106 | .105 | .103 | .102 | .101 | .0993 | .0978 | .0964 | .0951 | .0936 | .0922 | .0907 | .0899 | .0870 | .0840 | .0809 | .0777 | .0745 | .0711 | .0677 |
| - 50 | 0.136 | 0.135 | 0.133 | 0.132 | 0.131 | 0.129 | 0.127 | 0.126 | 0.124 | 0.123 | 0.121 | 0.120 | 0.118 | 0.117 | 0.115 | 0.114 | 0.112 | 0.110 | 0.109 | 0.107 | 0.106 | 0.104 | 0.103 | 0.0997 | 0.0962 | 0.0927 | 0.0891 | 0.0854 | 0.0816 | 0.0777 |
| - 45 | .155 | .154 | .152 | .150 | .149 | .147 | .145 | .143 | .142 | .140 | .138 | .137 | .135 | .133 | .131 | .129 | .128 | .126 | .124 | .122 | .120 | .118 | .117 | .114 | .110 | .106 | .102 | .0976 | .0933 | .0888 |
| - 40 | .176 | .175 | .173 | .171 | .169 | .167 | .165 | .163 | .161 | .159 | .157 | .155 | .153 | .151 | .149 | .147 | .145 | .143 | .141 | .139 | .137 | .135 | .134 | .129 | .125 | .120 | .116 | .111 | .106 | .101 |
| - 35 | .200 | .198 | .195 | .193 | .191 | .189 | .187 | .185 | .182 | .180 | .178 | .176 | .174 | .171 | .169 | .167 | .164 | .162 | .160 | .157 | .155 | .153 | .151 | .147 | .142 | .137 | .131 | .126 | .121 | .115 |
| - 30 | .225 | .223 | .220 | .218 | .216 | .213 | .211 | .208 | .206 | .203 | .201 | .198 | .196 | .193 | .191 | .188 | .186 | .183 | .181 | .178 | .175 | .173 | .171 | .166 | .160 | .154 | .149 | .143 | .137 | .130 |
| - 25 | 0.253 | 0.251 | 0.248 | 0.245 | 0.243 | 0.240 | 0.237 | 0.234 | 0.232 | 0.229 | 0.226 | 0.223 | 0.221 | 0.218 | 0.215 | 0.212 | 0.209 | 0.206 | 0.203 | 0.200 | 0.197 | 0.194 | 0.193 | 0.187 | 0.181 | 0.174 | 0.168 | 0.161 | 0.154 | 0.147 |
| - 20 | .284 | .281 | .278 | .275 | .272 | .269 | .266 | .263 | .260 | .257 | .254 | .251 | .248 | .244 | .241 | .238 | .235 | .232 | .228 | .225 | .222 | .218 | .217 | .210 | .203 | .196 | .189 | .181 | .173 | .166 |
| - 15 | .318 | .315 | .311 | .308 | .305 | .301 | .298 | .295 | .291 | .288 | .284 | .281 | .277 | .274 | .270 | .267 | .263 | .259 | .256 | .252 | .249 | .245 | .243 | .235 | .228 | .220 | .212 | .203 | .195 | .186 |
| - 10 | .355 | .351 | .347 | .344 | .340 | .336 | .332 | .329 | .325 | .321 | .317 | .313 | .310 | .306 | .302 | .298 | .294 | .290 | .286 | .282 | .278 | .274 | .271 | .263 | .254 | .246 | .237 | .227 | .218 | .208 |
| - 5 | .395 | .391 | .387 | .383 | .379 | .374 | .370 | .366 | .962 | .358 | .353 | .349 | .345 | .340 | .336 | .332 | .327 | .323 | .318 | .314 | .310 | .305 | .302 | .293 | .284 | .274 | .264 | .254 | .243 | .232 |

## NEW BOOKS & REPORTS

### Economics of Insulation

A research project sponsored by the graduate school of the University of Minnesota in cooperation with the engineering experiment station of that university was undertaken to show how, within certain limits of weather, insulation thickness, heating plants, etc., the cost of insulation (in a specified region) could be amortized by yearly fuel savings. The results of the project together with various recommendations are contained in a bulletin, Economics of Insulation, by Frank B. Rowley, head, department of mechanical engineering and director, engineering experiment station, and Richard C. Jordan, director, industrial laboratories, department of mechanical engineering, University of Minnesota.

In this booklet the authors describe very briefly and clearly the method of determining building heat losses and degree days. The formula for calculating yearly fuel consumption is also explained. However, this fundamental information is presented in a concise and nontechnical manner with the reader being referred for more detailed information to any standard text or reference book on heating and ventilating.

The reduction in building heat loss, the distribution of heating requirements, and the percentage savings obtained through various combinations of insulation, weatherstripping, and storm sash are shown graphically for two typical residences. Annual fuel costs are calculated but tabulated data for typical domestic heating plant efficiencies and heating values for various fuels are given so that the seasonal heating cost can be calculated for virtually any type of heating plant.

Since the cost of applying insulation to either a new or an existing structure will vary greatly with type of insulation, local labor conditions, and the periodic fluctuations in the cost of materials themselves, insulation cost data are not given. However, on the assumption that the amounts of material and hours of labor required for any given type of wall are much the same throughout the country, overall coefficients of heat transmission and the amounts of materials necessary for 289 types of wall construction are tabulated. The reader may then determine the comparative cost of different types of walls and ceilings when information on local labor and material costs is available.

An intersection chart is provided so that when the unit cost of fuel, degree days, heating plant efficiency, and overall coefficient of heat transmission for the wall or ceiling are known, the fuel cost in dollars per 1000 sq ft of wall per heating season may be determined.

In order to obtain a complete picture of the economic benefits of insulation, it is necessary to consider the annuity value of yearly fuel savings, the amortization of insulation costs, and the fact that insulation costs should reflect any savings due to the use of a smaller heating plant. These considerations are also discussed in this report which, though written primarily for persons in the residential field, should be of interest to anyone who is considering the use of insulation in order to reduce fuel costs.

This 69 p. paper covered booklet, bulletin No. 23, may be obtained from the Engineering Experiment Station, University of Minnesota, Minneapolis 14, Minn., for 40c.

## Revised Steel Boiler Rating Code

A code for rating and testing oil fired residential steel boilers and for rating commercial boilers has been issued by Steel Boiler Institute, Inc. This replaces the steel boiler code originally adopted in December 1929 which, with revisions, has been effective since its original adoption.

Residential steel boilers are defined by the code as those containing not more than 177 sq ft of heating surface and having catalog steam SBI net ratings not greater than 3000 sq ft when mechanically fired. Ratings are expressed in square feet of steam or water radiation and in Btu per hr, though boiler horsepower may be shown if desired. Steam ratings are considered as emitting 240 Btu per sq ft per hr, and hot water ratings are based on 150 Btu per sq ft per hr. One boiler horsepower is considered equivalent to 140 sq ft of steam radiation. ASME boiler code construction is required.

SBI net ratings for residential steel boilers include the load imposed by the connected radiation required to heat the building, and heat loss from piping up to 20 per cent of the installed radiation. Piping losses in excess of 20 per cent of the installed radiation must be considered as additional net load. The estimated maximum heat required by water heaters or other apparatus connected to the boiler must be considered as additional net load and extra boiler capacity must be provided for it.

Among the provisions for rating oil fired residential steel boilers under the new code are the following: 1—*heating surface*, the SBI net rating expressed in square feet of steam radiation shall not be greater than 17 times the heating surface of the boiler; 2—*carbon dioxide in flue gases*, the burner shall be set to produce 10 per cent carbon dioxide (plus or minus 0.2 per cent) in the flue gases; 3—*flue gas temperature*, the flue gas temperature shall not exceed 600 F when the boiler is operating at 150 per cent of the SBI net rating; 4—*efficiency*, the overall efficiency of the boiler and burner shall be not less than 70 per cent when operating at 150 per cent of the SBI net rating; 5—*draft loss through boiler*, the difference between the draft at the breeching and the draft in the firebox when the boiler is operating at 150 per cent of the SBI net rating shall be not greater than that determined by the formula: draft loss (in hundredths of an inch of water) equals net rating over 200, plus 4. This draft loss limitation shall not apply to integral boiler-burner units regularly cataloged and marketed complete with boiler, burners and refractory designed to operate with higher draft losses and where means is provided to develop sufficient draft to overcome the high draft loss; 6—*furnace volume*, the furnace volume shall be not less than one cubic foot for every 110 sq ft of steam SBI net rating. This limitation shall not apply to integral boiler-burner units.

Every boiler is to carry a plate that shows the manufacturer's name and address, the boiler number and type, the SBI symbol, the amount of heating surface, the SBI net rating in Btu for each type of firing recommended, and whether or not baffles or turbulators are used. Non-members of SBI, upon approved application, may receive permission to test and rate boilers according to the code.

A section of the code defines the test procedure for residential steel boilers and the calculations for oil fired test items. Manufacturers are to submit their test data, and the SBI will review these data and approve net ratings to be used for the equipment if test results are satisfactory.

No test procedure is provided or required for commercial steel boilers. Commercial boilers designed to be fired mechanically are rated in square feet of steam radiation equal to 17 times the heating surface of the boiler in square feet. The SBI ratings in square feet of steam for boilers designed for hand fired solid fuel are equal to 14 times the heating surface. A rating table in the code shows, for commercial steel boilers, the SBI net rating, heating surface in square feet, and the minimum furnace volume in cubic feet for mechanically fired boilers that are fired with a bituminous stoker. Furnace heights for stoker fired boilers have been determined in cooperation with the Stoker Manufacturers Association. Minimum grate areas are shown for hand fired boilers. These physical specifications for commercial boilers determine the SBI rating.

Copies of this steel boiler code, which has been developed by the engineering committee of the institute, are available through the Steel Boiler Institute, Inc., 366 Madison Ave., New York, N. Y.

## Electric Arc Welding Bibliography

A bibliography of papers and reports on arc welding constitutes No. 38 of the Technical Research Series issued by the research and standards branch of the Navy Bureau of Ships. The bibliography, which was prepared as a part of a novel research project on electric arc welding, is divided into four parts. The first is a concise list of references to articles written earlier than 1935 on the theory and characteristics of the electric arc. According to the preface, "These earlier papers report experimental work and discussions of the first use of electric welding and studies relating to the physics of the electric arc with relatively low amperage." The phenomena observed were of a general nature and the study was not primarily directed toward improvement of the welding arc.

The second part is an annotated bibliography of material from 1935 on. In general, the type of material covered consists of investigations of the electric arc phenomena with special reference to the welding arc, in air and in atomic hydrogen. Parts three and four are lists of welding research projects and welding codes.

The supply of these 8x10 in., 127 p. paper-covered booklets is nearly exhausted but reprints of this bibliography with an added chapter on electrodes and welding machines will be mailed free to libraries or to persons interested in the study and development of arc welding. Requests for copies should be addressed to the Research and Standards Branch, Bureau of Ships, Navy Dept., Washington 25, D. C.

# "Open for Discussion"

## AIR CONDITIONING AND EVAPORATIVE COOLING

THE EDITOR—

There have been some additional comments received from readers of my article, When Is Complete Air Conditioning of the Modern Factory Advisable?, published in the June and July issues. One engineer, for example, raises the question as to "how evaporative cooling would stack up as compared to complete air conditioning." The question is, of course, well taken, but here again it would seem desirable to determine just what standard of comfort we are attempting to accomplish with the evaporative cooling system.

For example, it would be possible to apply evaporative means for cooling the same volume of air as specified for the air conditioning (i.e., 1140 cfm per M sq ft at average internal loadings of $H_1 = 20$ Btu per hr per sq ft), thus resulting in a system costing only about two-thirds of that using complete air conditioning, including refrigeration. However, under average, summer, daytime outside air conditions (74 DB-62 WB-54.5 DP-50 per cent in Rochester), the resulting inside conditions would be about 83 DB-70 WB-63.5 DP, or an effective temperature of approximately 76.5. This would provide comfort to only about 25 per cent of the occupants for half the summer daytime working hours and is thus not up to the minimum standard of comfort, previously proposed, of providing comfort to 75 per cent of the occupants for at least half the working hours.

To improve this condition, it is necessary, of course, to treat a larger volume of outside air, and it can be shown that the desired comfort level can be obtained by evaporatively cooling approximately 1670 cfm per M sq ft outside air at average internal loads of $H_1 = 20$ Btu per hr per sq ft. This system would have an initial cost of about $1500 per M sq ft, compared with $1540 per M sq ft for air conditioning, the yearly operating cost for the two types of systems being $107 per M sq ft and $124 per M sq ft, respectively. Considering the greater comfort for longer periods with the air conditioning, the slight saving in operating cost does not appear to be worthwhile.

There is another angle to the question of using evaporative cooling generally, however. The effectiveness of this means of reducing resulting effective temperatures inside spaces is very much affected by the moisture content of the outside air available, and the above comparison for Rochester, N. Y., is in one of the more favorable locations in the country. For example, of wet bulb weather data compiled in the Marley Co.'s Summer Weather Data publication, only 17 out of a total of 64 cities reported showed average, summer, daytime wet bulb temperatures equal to or lower than the 62 F figure used in the above comparison for Rochester.

To illustrate the importance of this latter factor, the comparison previously drawn for Rochester has been extended to a similar, but imaginary, project in New York City. Here the maximum outside air conditions have been taken as 100 DB-81 WB-74.5 DP-45 per cent, average conditions as 79 DB-67.2 WB-61 DP and 54 per cent. Under these conditions, and at internal loadings of $H_1 = 20$ Btu per hr per sq ft, the conditions resulting inside the space would provide the proper standard of comfort only when evaporatively cooling approximately 3000 cfm per M sq ft floor area, and the first cost would rise to about $2700 per M sq ft. The more severe design conditions in New York City would, of course, increase both operating and capital costs of air conditioning, but it can be safely stated that an evaporative cooling system in New York City, *designed to provide the proper standard of comfort,* would result in capital costs considerably greater than for air conditioning, and with little or no saving in yearly operating cost.

To aid in interpreting the above figures, a table is attached, after the form of the original Table 2 (p. 306, June HPAC), with suitable figures for evaporative cooling in both Rochester and New York City, including the original figures for air conditioning in Rochester for comparison.

To summarize this important phase, I suggest that many of us who have been concerned with design and specification of air conditioning and ventilation systems have in the past been prone to regard the ventilation or evaporative cooling system as a compromise installation where complete air conditioning could not be justified. Has not our attitude in many cases been to "take what we could get" without considering too accurately the degree to which the compromise installation filled the need? It has been the primary purpose of the writer's original report to suggest a suitable standard of comfort to be strived for in these compromise installations, and the one proposed—namely, comfort to 75 per cent of the workers for half or more of summer daytime working hours—does not seem an unduly severe one. That the application of this standard appears to show the compromise methods uneconomical is only an indication of the efficiency of mechanical refrigeration means as compared to other ways of removing the heat generated inside working spaces.

Another reader of my articles raises essentially two questions:

1) Whether or not the resulting effective temperature inside the space, shown as 72.5, should not actually be 82.5. He states "72.5 F effective is better than can be obtained with any number of air changes most of the time in the summer in any locality in the United States without refrigeration," and "82.5 F is the best that could be obtained in Rochester in summer with ordinary ventilation, irrespective of the number of air changes."

2) The temperature at which comfort is experienced in industry.

**Summary of Design Factors From Which Cost Comparisons on Evaporative Cooling vs. Air Conditioning Are Made[1]**

| | Internal Heat Load = $H_1$ = 20 Btu per Hr per Sq Ft | | |
|---|---|---|---|
| | Evaporative Cooling New York City | Air Conditioning Rochester | Evaporative Cooling Rochester |
| 1. Cooling load, Btu per hr | | | |
| Conduction | 78,100 | 78,100 | 78,100 |
| Sun effect | 56,300 | 56,300 | 56,300 |
| Internal | 560,000 | 560,000 | 560,000 |
| Subtotal | 694,400 | 694,400 | 694,400 |
| Outdoor air (net) | | 393,000 | |
| Total | 694,400 | 1,087,400 | 694,400 |
| 2. Air volumes, total cfm | 84,000 | 32,000 | 46,700 |
| (a) cfm per M sq ft | 3,000 | 1,140 | 1,670 |
| (b) cost per cfm | $ 0.90 | $ 0.90 | $ 0.90 |
| (c) cost per M sq ft | 2,700 | 1,030 | 1,500 |
| 3. Refrigeration, gross tons | | 90.5 | |
| (a) tons per M sq ft[2] | | 2.6 | |
| (b) cost per ton | | $ 195 | |
| (c) cost per M sq ft | | $ 510 | |
| 4. Total capital costs per M sq ft | $2,700 | $1,540 | $1,500 |
| 5. Annual operating costs[3] | | | |
| (a) Total | | $3,469 | |
| (b) per M sq ft | $ 124 | $ 124 | $ 107 |
| 6. Resulting room conditions | | | |
| Max.[4] Dry bulb temperature | 89.6 F | 80.0 F | 88.2 F |
| Effective temperature | 85.5 F | 72.5 F | 82.5 F |
| Aver.[5] Dry bulb temperature | 76.0 F | 75.0 F | 76.7 F |
| Effective temperature | 72.5 F | 69.2 F | 72.5 F |

[1] Based on one floor of a general purpose building having a floor area of 28,000 sq ft in Rochester, N. Y., or New York City. In warmer latitudes, the comparison would be more favorable to air conditioning.

[2] At 82% diversity factor.

[3] Not including cost of heating building shell, which will be the same for either system.

[4] At maximum outside air conditions of 92° — 79° — 73.5° — 54%, in Rochester, N. Y.; 100° — 81° — 74.5° — 45% in New York City.

[5] At average outside air conditions of 74° — 62° — 54.5° — 50% in Rochester, N. Y.; 79° — 67.2° — 61° — 54% in New York City.

He suggests that 78 F effective temperature provides acceptable comfort for people "standing or walking around."

Regarding the first of these questions, the resulting effective temperature inside the space, shown as 72.5 F, was not an error in transcription. It results when circulating 3330 cfm per M sq ft floor area (20 changes per hour at $H_1 =$ 20 Btu per hr per sq ft), entering the space from the outside at the average summer daytime condition in Rochester of 74 DB-62 WB-54.5 DP-50 per cent. This volume of air would absorb internal and other heat loads of 20,400 Btu per hr from the space, which would reheat the supply air to 79.5 DB-64 WB or 72.5 effective temperature. Since the average entering air conditions would be exceeded for 490 out of 976 possible summer daytime hours, it follows that the resulting inside conditions would be worse than the 72.5 effective temperature for only about half the summer daytime working hours.

All the above figures are given in the original report and are summarized in Table 2.

Referring to the second question, it is assumed that reference is being made to the data given in the report, Air Conditioning in Industry, by W. L. Fleisher, A. E. Stacey, Jr., F. C. Houghten, and M. B. Ferderber, in volume 45 of the ASHVE Transactions, 1939.

The pertinent data there presented gave the reactions of nine individuals to atmospheres at effective temperatures from 77.5 to 92.5, who, as a group, expressed themselves as being comfortable at the lower effective temperature level. The authors of that paper, however, state, "It is difficult to explain the difference in indicated effective temperature for comfort conditions in this study and previous ones."

In actual practice, we have found the 78 effective temperature (90 DB-67 WB in still air) accepted as comfortable by few workers, whatever their degree of activity. Although it is an observation not backed by experimental evidence, it is our experience that the 71 optimum effective temperature reported in previous studies applies equally well to a wide variety of activities, including light assembly and machine work, various machine operations, and clerical and laboratory work.—H. A. Mosher, mechanical engineer, Kodak Park Works, Eastman Kodak Co.

## AIR DUCT FRICTION CHART

The Editor—

We have used the Air Duct Friction Chart, by Harold S. Morton, published in the December 1940 issue of HPAC, in sizing duct work in preference to other charts for this purpose. Of course, our copy is now well worn and is becoming illegible.

We would like to suggest publishing the chart on suitable heavy paper or board and making it available to the industry through suitable channels. If this is done, please make two copies available to us.

In the meantime, we would like to have permission to photostat this chart for our own use. We will not make it available outside of our organization without permission.—B. L. P.

## METHODS OF FILING ENGINEERING DATA

Several readers of Heating, Piping & Air Conditioning have written the editors just recently for information on methods of filing or cross-indexing articles published in HPAC and other magazines, technical papers and reprints, catalog data, etc.

Under the title, How to Acquire a Reference Library, George T. Condron described—in the April 1938 issue of HPAC—a method of assembling and classifying articles and papers from back issues of publications in loose-leaf binders, the arrangement of the material, and the advantages of his method. In the September 1938 issue, William

Goodman wrote on Filing Technical Papers and Articles, giving a description of a method of doing this, a list of the file folders used, and the good points of the system.

In our own office, we use standard file folders, their titles being based on the product classifications given in the Directory Section published each year in Heating, Piping & Air Conditioning. Inasmuch as this is a listing of products, it is necessary to supplement the headings, as the need arises, with folders on such subjects as Piping—Flow of Fluids; Heating—Radiant; Air Conditioning—Water Supply; and many others. Use has also been made of the Standard Filing System and Alphabetical Index issued by the American Institute of Architects, 1741 New York Ave., N. W., Washington, D. C., although for HPAC's editorial files, the breakdown of titles in some classifications is not as complete as might be desirable.

Material is also filed in HPAC's office by types of buildings—Schools, Churches, Banks, etc.—and by industries, using the breakdown of industries from the U. S. Census classifications.

HPAC's editors would welcome information for publication on convenient methods of filing engineering and technical data used by engineers and contractors.

# FASTER, BETTER PRINTING WITH AIR CONDITIONING

Air conditioning that controls temperature to within 1 F and humidity to within 1 per cent of desired levels is expected to result in faster and less costly printing on paper that is more thoroughly seasoned and thus of better quality, in a new $1,900,000 plant under construction for the Newman-Rudolph Lithographing Co., Chicago. The windows are to be triple glazed, with hermetically sealed air spaces between the panes.

Charles H. Newman, president of the concern, told the Refrigeration Equipment Manufacturers Association that the system will solve numerous problems hitherto encountered.

Aside from maintaining working conditions that are ideal for comfort, the plant's air conditioning will save both the time and space ordinarily required in the seasoning of lithograph paper to the climatic conditions inside the plant, Mr. Newman said. Varying temperatures cause the paper to stretch, shrink, curl, or wrinkle during processing and considerable space has been needed for hanging the paper for proper seasoning before use. To this saving in space and time cost will be added the advantage of better quality paper.

Another important economy resulting from the air conditioning in the plant will be a reduction in spoilage, coincident to the making of lithograph plates, Mr. Newman reported. It is the egg albumen used in the process which spoils if it becomes too warm.

Printing production will be speeded throughout the entire year in the plant, since the air conditioning system's design calls for year 'round temperature control. The equipment itself will be installed in a monumental tower at the center of the building to conserve space and enhance the design.

### Typesetting Plant

A $45,000 plant nearing completion for the Logan Square Typesetting Co., also of Chicago, is to have filtered warm air distributed by ducts, the air being heated by a gas fired hot water boiler supplying indirect heating coils, and fluorescent illumination throughout the composing room.

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## Chemical Engineering Thermodynamics

To most mechanical engineers, chemical thermodynamics is an esoteric science full of pitfalls and abstract phrases. This book, Chemical Engineering Thermodynamics, is written in a homely style that is far easier to read than other books on the subject. Insofar as the subject can be made clear, the author, Barnett F. Dodge, professor of chemical engineering, Yale University, has done an admirable piece of work.

This book will be of special interest to those mechanical engineers who are interested either in the dehumidification of air by chemical methods or in absorption refrigeration. The text also has an admirable theoretical treatment of mechanical refrigeration and of fluid flow.

Aside from the foregoing subjects, the book deals mainly, as is to be expected, with the theory and applications of thermodynamics to chemical processes. However, the basic theory underlying the entire field of thermodynamics is presented in such a lucid manner that mechanical engineers interested in obtaining a broad and fundamental understanding of thermodynamics can profit from study of this text. There are 680 + xviii pp., 5¾x8¾ in. The publisher is the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y., and the price is $6.00.—*W. G.*

## Revised Chicago Building Code

Revisions and amendments to January 1, 1945, of that portion of the municipal code of Chicago relating to buildings have been issued in pamphlet form by order of the city council. The chapters of the code which have been revised—Nos. 13, 39 to 81, 84, 85, and 89—include such subjects as enforcement of building regulations; building plans, permits, certifications, and inspection; general and detail requirements for various types of buildings with respect to construction, room sizes, fire areas, heating provisions, ventilation, steam boilers and unfired pressure vessels, and mechanical refrigeration. With the exception of the plumbing, electrical, and fire prevention ordinances, this booklet contains all of the chapters in part 5 of the municipal code of Chicago, entitled Buildings.

Also issued is a mimeographed supplement containing the amendments and revisions to the Chicago building ordinances adopted by the city council between January 1 and July 1, 1945.

The 5x8 in., 430 p., paper covered pamphlet, containing revisions to January 1, 1945, may be purchased from the Municipal Reference Library, Room 1005, City Hall, Chicago 2, Ill. The price is $1.00 each. The supplement will be furnished upon request.

## Practical Pointers

## ...on Operation, Maintenance, Repair, Alteration, Extension

**You are invited to contribute a "practical pointer" on operation, maintenance, repair, alteration, or extension of a heating, piping, or air conditioning system serving a plant or large building, for publication here. Address The Editor, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.**

# SAVING FUEL IS GOOD BUSINESS

### *Wartime National Fuel Efficiency Program Closes, But Objectives Are Still of Value*

THE ACTIVE volunteer work of the National Fuel Efficiency Program, which was conducted in cooperation with the U. S. Bureau of Mines, was brought to a close on October 15, except in a few cases where the local coordinator felt it was advisable to continue for a short time.

This action came as a result of the findings of the fuel authorities that, with the ending of the war, the fuel situation is no longer serious enough to make it necessary to continue to call on volunteer forces for their help. This does not, of necessity, mean that there is plenty of fuel now available but rather that fuel conservation is now a peace-time problem, according to Thos. C. Cheasley, supervising engineer, and Kenneth M. Waddell, assistant supervising engineer, of the National Fuel Efficiency Section of the bureau.

From information now at hand, it is apparent that the program was well on its way toward achieving its goal of saving 29 million tons of bituminous coal and proportionate amounts of other fuels for the year. A happy ending of the war has now made it unnecessary that that goal be attained.

Fuel conservation—a wartime necessity—is, however, good business and sound engineering always. It is really cheaper to burn 100 dollar bills than to burn $100 worth of coal or other fuel needlessly. For this reason, the wartime objectives of the National Fuel Efficiency Program should be remembered now, and everyone concerned with the utilization of fuels might well continue to aim at them.

One of the valuable features of the program was the extensive series of "quiz sheets" on fuel efficiency developed in cooperation with various manufacturer groups and distributed by the program's regional engineers to "waste chasers" in individual plants and buildings. Because the information from these sheets is still just as valuable as it was during the war, we plan to print a number of them from time to time in HPAC, with the approval of the National Fuel Efficiency Section of the Bureau of Mines, which is part of the U. S. Department of the Interior.

The first two of these sheets to appear in HPAC are published this month. The quiz on gate, globe, and angle valves was prepared by the Valve Manufacturers Association and was No. 134 of the series. The quiz on flow meters, No. 118 of the series, was prepared by the Flow Meter Manufacturers Industry Committee.

We are omitting from each of the sheets the final question: "What are your suggestions for saving fuel and preventing waste?" Perhaps this question is the most important of all fuel saving tips, for the operating engineer knows his own plant better than does anyone else, and his "suggestions to himself" for conserving fuel, *if carried out*, often represent the most important fuel conservation opportunities.

**A VALUABLE feature of the National Fuel Efficiency Program, in cooperation with the Bureau of Mines, was the extensive series of "quiz sheets" containing tips on methods of conserving fuel in the use, operation, maintenance, and repair of various items of piping, heating, and air conditioning equipment. Because fuel conservation—a wartime necessity—is always good business and sound engineering, it is planned to publish in HPAC from time to time the very worthwhile information from these sheets. The first two to appear in our pages follow, and are devoted to valves and to flow meters**

# 15 Good Tips on Valve Maintenance and Repair

**1) Do you inspect your valves regularly?**

*It is advisable to set up an inspection schedule and follow it closely. Much fuel may be wasted because of leaking valves.* Inspection also often prevents the necessity of costly repairs, or the purchase of new valves.

**2) How do leaking valves waste fuel and energy?**

A few examples of waste resulting from leaks of a certain size are:

a) A 1/32 in. diameter leak at 100 psi steam pressure allows *about* 3200 lb of steam to escape per month.

b) A ⅜ in. diameter steam leak at 100 psi pressure results in the loss of *about* 460,000 lb of steam per month.

c) A 1/32 in. diameter leak on a water line at 40 psi pressure wastes *about* 4800 gal per month.

d) A ⅜ in. diameter water leak under similar conditions results in a loss of *about* 690,000 gal per month.

**3) Where do valve leaks commonly occur?**

Leaks may occur about the stuffing box of the valve, through the seat, or through the joint between the body and bonnet of the valve.

**4) What is the best way to correct stuffing box leaks?**

Leaking stuffing boxes are caused generally by the packing nut being too loose, or the packing worn out. In the first instance, a simple tightening of the packing nut will remedy the leak. If the cause is old or worn out packing material, close the valve, or open it wide—depending upon the type of valve in use—loosen the packing unit, lift up the gland, remove old packing from the stuffing box, and repack either with string packing or molded packing of the correct size. Be sure to pack the stuffing box nearly full. Replace gland, tighten with packing nut until tight enough to prevent any leakage, but still allow easy spindle action. Spindles are motivating parts of a valve—keep them clean, free from dust, dirt and corrosion, and lubricate them at regular intervals.

**5) What is the best procedure to follow in checking valve seat leaks?**

Leaks through the seat are generally indicated by the inability to close the valve tightly, and are indicated by leakage through the pipe line. In this case the line should be closed, the bonnet removed from the valve, and the disc and seat inspected. Trouble here is generally caused by scale, metallic fragments, or other foreign matter in the lines, or by "wire draw" caused by the valve not having been fully closed, and fluid at high velocity passing through a restricted area, cutting the seat or disc.

**6) What is the recommended procedure in repairing the seats in globe and angle type valves?**

Examine the disc; if pitted, cut or cracked, and if of the renewable type, replace with a new disc of proper composition; or if of the regrindable type, follow the manufacturer's instructions for regrinding, using a fine grained regrinding compound. If seats show signs of a "wire draw," those of the flat seat type should be resurfaced with a valve reseating tool, but if not deeply cut, may be resurfaced by the use of an emery cloth on a suitable mandrel.

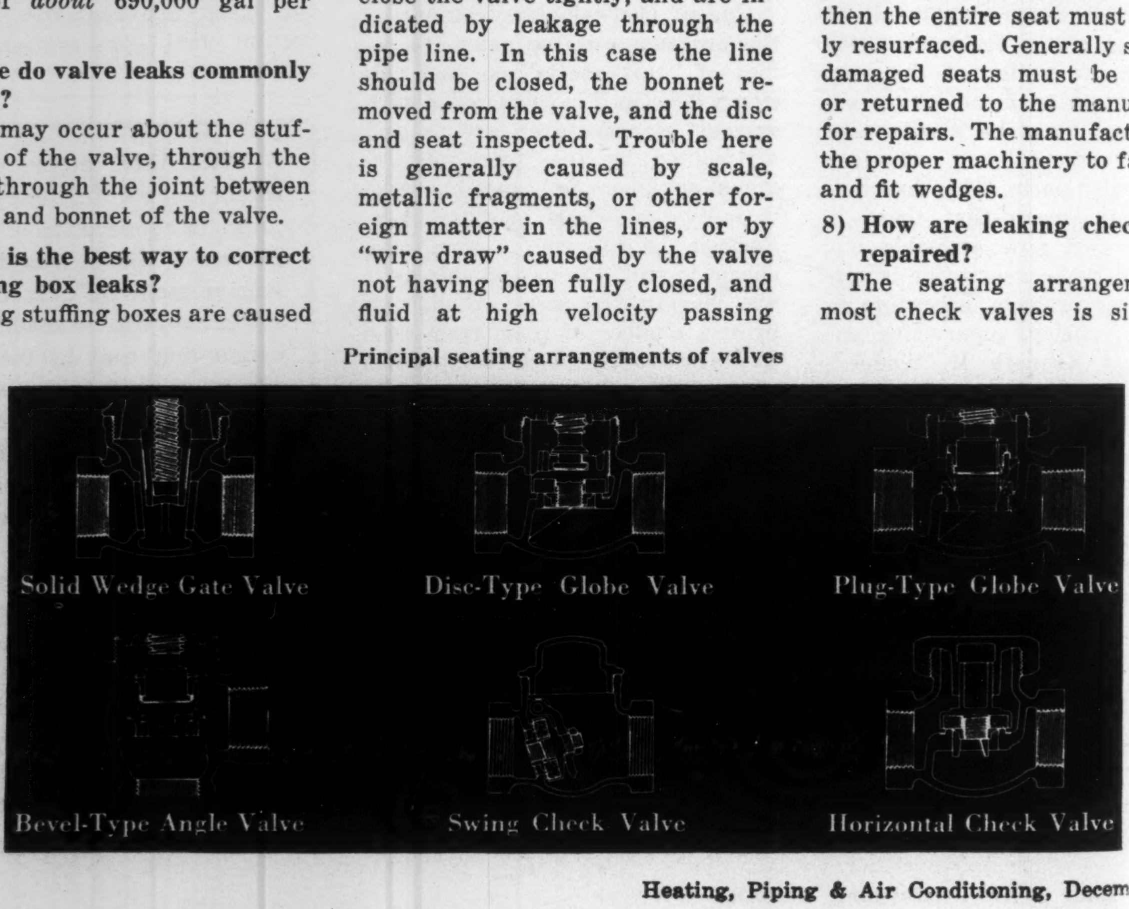
**7) What is the recommended procedure in repairing gate valves?**

The stuffing box of a gate valve is checked as suggested above. If the leak is about the seat, remove the bonnet, inspect the wedge or wedges, and if slightly pitted or scored, refinish carefully with fine emery cloth on a board. In some types the wedge may be replaced in a reverse position which often will remedy the leak. If the seats are worn or pitted, extreme care must be used as only the smallest pit or scratch can be removed and then the entire seat must be evenly resurfaced. Generally speaking, damaged seats must be replaced or returned to the manufacturer for repairs. The manufacturer has the proper machinery to face seats and fit wedges.

**8) How are leaking check valves repaired?**

The seating arrangement of most check valves is similar to

Principal seating arrangements of valves



**Valve**—Any of the numerous devices by which the flow of liquid, fluid, loose material in bulk, etc., may be started, stopped or regulated by a movable part which opens, shuts or partially obstructs one or more ports or passageways.—(Webster's International Dictionary).

that of a globe valve. Follow the same procedure as for globe valves.

**9) How are packless valves maintained?**

There are a number of types on the market, the basic principal being that a diaphragm or bellows is used to eliminate the need of valve spindle packing. The manufacturer should be contacted for his instructions as to repair and maintenance.

**10) Does the joint between the body and bonnet of the valve leak?**

If leaking, a tightening of the bolts will generally stop a leak, but if not, a new gasket is necessary in large valves. In smaller valves that have a screwed bonnet connection, an examination of the joint and such repairs as may be found necessary should be made. Often, simply lubrication and a tightening of the joint will stop the leakage.

**11) What may be the cause of persistent valve leaks?**

Leaks of this kind are frequently the result of improperly threaded connecting pipe, in which case it is probable that the pipe has been drawn against the interior or diaphragm of the valve, forcing it out of shape. If this be so, a new body is necessary.

**12) Are you using gate, globe and angle valves in the proper service?**

Faulty valve performance is sometimes due to the use of the wrong type for a particular service. Gate valves should be used only fully open or fully closed, never for throttling service. Certain types of globe and angle valves are good for one type of service but not for another.

**13) What is the best procedure to follow when in doubt about valve repairs?**

Find the name of the maker of the valve, write him, giving the figure number, or a complete description of the valve and, if possible, a sketch of it with its size, metal it is made of, type of seat, and what the trouble seems to be. The maker will gladly give you instruction as to how to proceed.

**14) Do you keep on hand a stock of the commonly needed repair parts?**

So that the ordinary repairs may be made promptly when they are required it is advisable to have on hand a supply of repair parts and the needed equipment for making repairs.

**15) Before selecting the valve for a particular service do you consult the valve manufacturers' literature?**

It is important that you follow the advice of the valve manufacturer in selecting the correct type of valve, and in caring for the valve after it is installed. If you do not have the manufacturers' service bulletins, we urge you to get them immediately. The manufacturers of your valves are best qualified to instruct you in their care.

# 12 Helpful Ideas on Flow Meters to Aid Efficiency

**1) What is the purpose of flow measurement?**

Flow measurement provides the operator with the information that guides him in the balanced and economical operation of the boiler and process plant.

**2) What is a flow meter?**

A flow meter is a device for measuring the flow of fluid (water, steam, oil, gas, air, etc.). There are several types of flow meters used, but the most common is that which uses a primary element such as an orifice plate, venturi tube, flow nozzle, or other differential-pressure-creating device in the pipe line through which the flow is to be measured.

**3) How does a flow meter operate?**

The flow of fluid through the primary element creates a differential pressure. A U-tube partially filled with mercury or other liquid is connected to pressure taps in the pipe line at this primary element. (See Fig. 1.) The difference in pressure across the primary element causes a difference in liquid level in the U-tube, which difference is a measurement of the flow. This difference in level is transposed mechanically or electrically into an indication, record, or integration of the flow.

**4) How can these charts and integrator readings lead to fuel savings?**

Much information may be obtained by analyzing the records of flow. Steam load conditions, unnecessary use of steam or water, efficiency and cost of steam generation or heating, operation of steam consuming equipment may be determined from these records. Logs should be kept with steam and water meter readings included to show trend in requirements for steam. Fuel can be saved through their use.

**5) Why is the location of the primary element important?**

It is essential for accurate measurement that the primary element be correctly installed in the pipe with pressure connections accurately located and with sufficient lengths of straight pipe preceding and following the primary element, all in accordance with established standards.

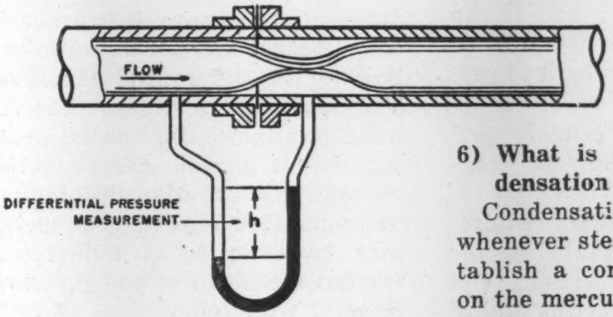


Fig. 1

**6) What is the purpose of condensation chambers?**

Condensation chambers are used whenever steam is measured to establish a constant head of water on the mercury of the meter. They

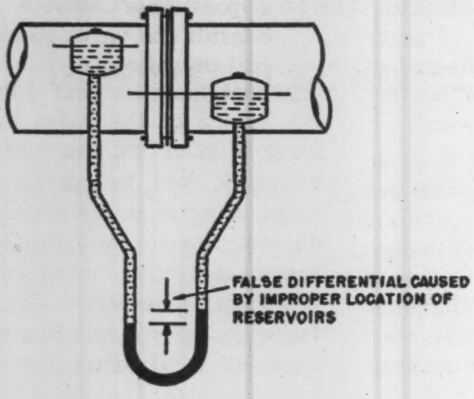

FALSE DIFFERENTIAL CAUSED BY IMPROPER LOCATION OF RESERVOIRS

Fig. 2

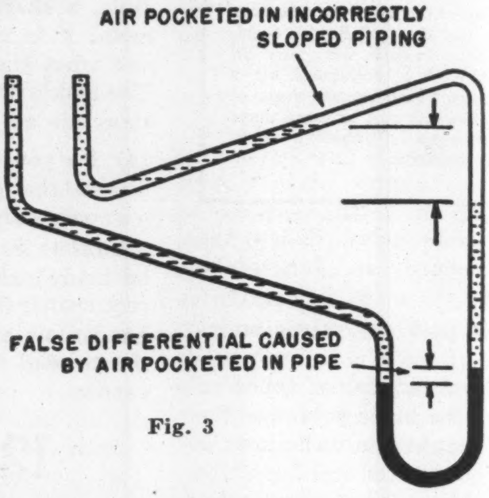

AIR POCKETED IN INCORRECTLY SLOPED PIPING
FALSE DIFFERENTIAL CAUSED BY AIR POCKETED IN PIPE

Fig. 3

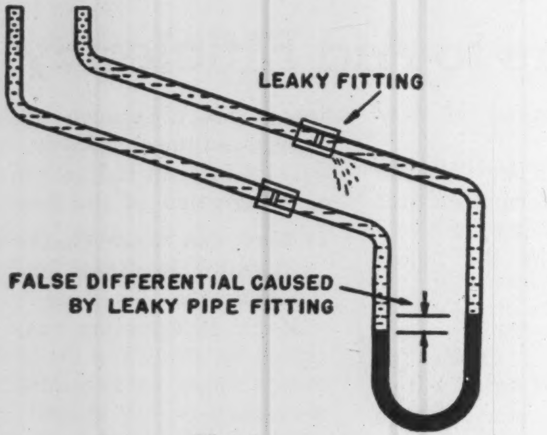


Fig. 4

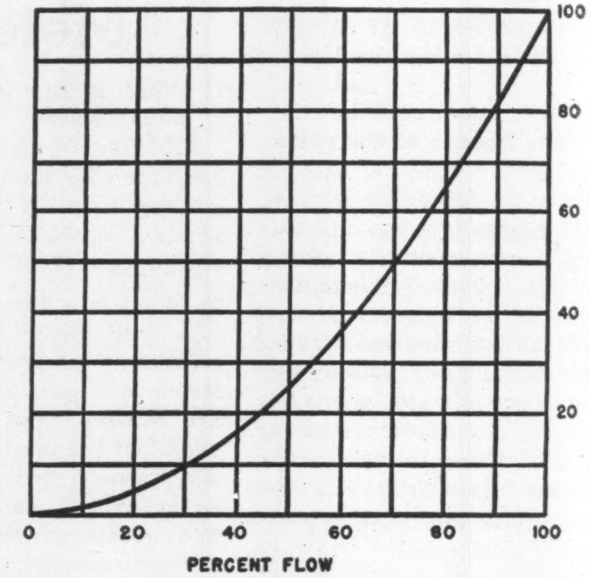


Fig. 5

must be at the same level even though the steam pipe is inclined or vertical, otherwise an error will result in the flow measurement. (See Fig. 2.) They are not required when measuring water, oil, air or gas.

**7) Where should the recording element be located?**

It should be mounted on a substantial support, free from vibration, excessive temperatures, and possible damage. It should be easily visible to the operator so that he may be guided by it in performing his duties.

**8) How should the primary and recording elements be connected?**

Specific installation requirements have been established for installation of the primary element, meter, and connecting piping to obtain accuracy. These must be followed. All connecting piping must slope not less than 1 in. per ft to avoid air pockets. (See Fig. 3.) All joints, fittings and valves must not leak and should be checked periodically. (See Fig. 4.) Consult manufacturer's instructions.

**9) What is the calibration characteristic of a flow meter?**

Although the meter measures differential pressure, it is generally calibrated to read flow equivalent to the differential pressure. The flow is not a straight line relationship to the differential pressure but it is proportional to the square root of the differential pressure. (See Fig. 5.) The meter may have an equal differential (square root flow) or an equal flow interval scale.

**10) How is a flow meter checked for accuracy?**

By closing the valves in the lines to the primary element and opening the equalizing valve at the meter, the zero setting of the meter may be checked periodically. The meter may be checked at other values by use of a calibrating water column which subjects the meter to differential pressures within the range of the meter.

**11) Do variations in the character of the fluid affect the accuracy of the measurement?**

Yes. Variations in density of flowing fluids such as those caused by variations in pressure, temperature, moisture content of steam, and many other factors affect the accuracy of measurement since the meter can be calibrated to measure a fluid under one set of such conditions only. Correction factors must be used for all changes from those of the original calibration.

12) **Do flow meters require occasional attention?**

Yes. Connection lines should be blown down periodically to remove all pipe scale, dirt, and sediment. In addition, meters should be inspected, cleaned, and adjusted according to manufacturer's instructions. If you do not have instructions, obtain them from the manufacturer.

## For good operation, remember

# AIR IS A FUEL

### *Erwin J. Davis Stresses Importance of Volume of Air Flow to Furnaces*

NEXT TIME you ask someone the question, "What fuel are you burning?" the odds are 10 to 1 that the answer will be only a half-truth, and that goes whether the answer is coal, gas, oil or wood. Never will any of these materials burn without another fuel named oxygen.

But, because air is one-fifth oxygen, and because oxygen is thoroughly mixed with other constituents of air, we must think of air as a fuel, rather than think of only oxygen as a fuel. Coal—or oil, gas, or wood—is only a *portion* of a fuel.

Because air and its oxygen are free, there has arisen the thought that the furnace will get enough oxygen "somehow or other." In summer, when the boiler room doors and windows are open, this may be true, but in other seasons that thought is not correct, and its incorrectness wastes fuel and causes the use of more boilers than would be needed if sufficient air were allowed to reach the furnaces under the normal amount of boilers in use.

Note that I said, "to reach the *furnaces.*" Nothing was mentioned concerning the act of permitting air to enter the boiler room. That act of permitting air to enter the boiler room is the point of trouble.

It is reasonable to assume that, once air enters the boiler room, the air will find its way to the furnaces. In winter, the incoming air will pour over the boiler room floor like Niagara Falls and, to the fireman, it may seem as if he were standing barefoot in an icy mountain stream. The fireman does not like this condition, and he *does* something about it. He closes the windows and the doors. The air continues to enter the boiler room in drastically reduced quantity, by way of the keyhole and the tiny space under the door, and the rate of combustion in a closed boiler room drops, and drops fast and low. The fireman knows that he must maintain steam pressure, so he fires up another boiler. If necessary, he fires up a second boiler; sometimes he will fire up a third boiler if the day is extremely cold.

Here is where costs increase. The extra boilers each have a furnace under them. Each furnace requires oxygen. The normally-operated furnaces were not getting enough oxygen *before* the extra boilers were put into operation, and now the normally-operated furnaces are getting less oxygen because of the extra boilers. Volatile gases, unburned and loaded with Btu's, roll out of the stack, and their potential heat is lost forever—even though you paid for that potential heat when you bought the coal, oil, gas.

### How Correct the Condition?

What is the proper method of correcting this undesirable condition? It isn't as simple a remedy as removing a pane of window glass or cutting a hole in the door of the boiler room. The fireman's welfare must be given attention, or else he will give no attention to your interest. The air-fuel must be piped from outdoors to the furnace. If you have an air preheater, the air will be piped from the outside directly to the preheater, and then the air will be piped from the preheater to the furnace. This does not mean that a forced draft fan is necessarily needed. Atmospheric pressure will do the job in most instances *if* you will permit atmospheric pressure to help you. Spend a few dollars to install an air duct of a large diameter and you will be money ahead.

Too much emphasis has been placed upon the subject of draft. Too little thought has been given to the *volume* of air flow to the furnace. Since we know that air is a fuel, sufficient volume of air must be delivered to the furnace. Draft pressure and volume of air flow are as inseparable as Lea & Perrins. The reason is this: The draft pressure is a function of the thickness of the fuel bed, while the volume of air flow is a function of the carbon content of the fuel.

### Air Volume and Draft

If you are burning air and oil, the fuel bed is extremely thin. Yet, oil contains a large amount of carbon, and this means that you must have a large volume of air flow to your furnace. But because the fuel bed of an air-and-oil furnace is very thin, you do not require a large draft pressure.

If you are burning air and coal, the thickness of your fuel bed may be as much as 6 in. A layer of coal 6 in. thick is a stiff resistance to air that is attempting to push through the coal. What will accomplish the job? Draft pressure and nothing but draft pressure. What will supply the air-fuel in sufficient quantities to burn all of the coal? The answer is volume of air flow.

**IF YOU ask someone what fuel he is burning, and he says coal (or oil, gas, or wood) his answer is only a half-truth, for oxygen must also be supplied the furnace. Because air and its oxygen are free, supplying it to the boiler furnace is often neglected. Mr. Davis, a life member of the American Association of Engineers, reminds us here that provisions must be made for getting air to the fires if operation is to be satisfactory.**

# THE ADVENTURES OF A POUND OF STEAM . . . . . 4

**By A. C. Kirkwood**
**Burns & McDonnell Engineering Co.**
**Consulting Engineers**

**A SUBSCRIBER suggested recently that a series of articles on what happens to a pound of steam as it travels through a piping system would be of interest to him and — he thought—to many others. Mr. Kirkwood, a member of HPAC's board of consulting and contributing editors, agreed to write about some (at least) of the adventures of A.P. Steam, and in the January issue he established the character of our hero by reference to a set of steam tables. In March he discussed some of the restraints put upon A.P.'s natural exuberance by valves of various types, each of which exacts some penalty in friction loss, and in May he explained the piping friction loss encountered by A.P. This month, Mr. Steam and 99,999 of his brothers flow each hour from a superheater outlet and encounter friction loss.**

WHEN LAST heard from, A. P. Steam was thoroughly involved in a maze of rules and regulations governing his behavior as he followed a supposedly free path through a pipe. As he and his fellows shoulder their way along the pipe, they lose some of their energy. Investigators have determined with reasonable accuracy how, why, and to what extent these losses occur. We considered, during our last meeting, a brief statement of the theory of some of the factors involved in a study of these losses. A. P., being a practical person, asks for specific cases.

Definition of steam conditions is of paramount importance. So, A. P. and 99,999 of his brothers are found flowing each hour from a superheater outlet. These 100,000 units have an initial pressure, measured at the superheater outlet, of 420 pounds per square inch absolute (psia) and their total temperature is 700 F. Each unit (pound) occupies a volume of 1.5684 cu ft.

The superheater outlet is connected to an 8 in., schedule 40, seamless steel pipe. We will assume a 10 ft length of pipe between the superheater outlet and the first change in pipe configuration. Physical characteristics of this pipe are: 8.625 in. outside diameter (OD); 7.981 in. inside diameter (ID), or $d$; 0.322 in. wall thickness; 50.027 sq in. internal area, or $a$; 0.3474 sq ft internal area, or $A$; $d^5$, the fifth power of the ID, $= 32{,}380$.

Velocity is calculated by the formula $V' = q/A$, which is converted to the more useful form of $V = 2.4Wv/a$. Substituting in this velocity formula, we find that

$$\begin{aligned} V &= 2.4 \times 100{,}000 \times 1.5684/50.027 \\ &= 7524.2 \text{ fpm} \\ V' &= 125.4 \text{ fps} \end{aligned}$$

Viscosity has been and is largely determined from experimental data. Correlation of these data has resulted in a rather accurate knowledge of the viscosity of steam. From Fig. 1* we find that A. P.'s viscosity is 0.026 centipoise (approximately). The Reynolds number is calculated from the formula

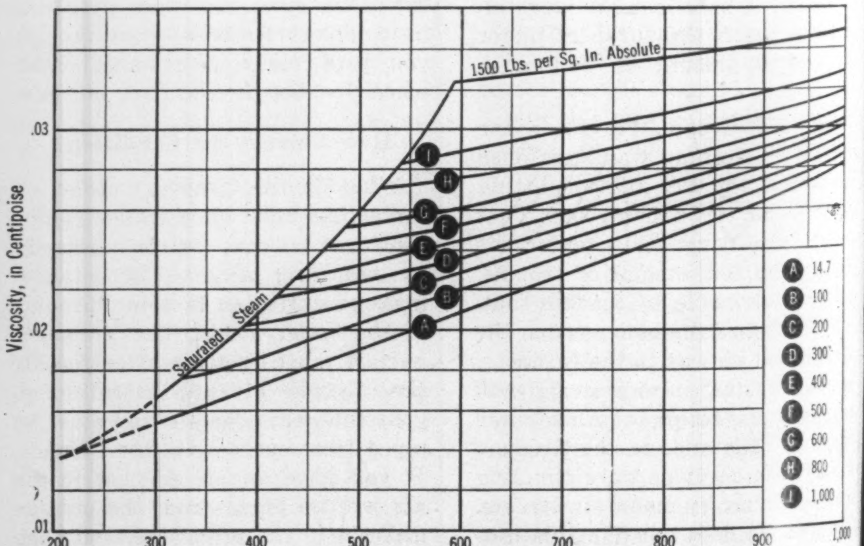
$$\begin{aligned} R_e &= 6.32W/d\mu \\ &= 6.32 \times 100{,}000/7.981 \times 0.026 \\ &= 3{,}045{,}000 \end{aligned}$$

The friction factor, as found from a curve such as that of Fig. 2, is approximately 0.013. Pressure drop is calculated for turbulent flow conditions, since the Reynolds number exceeds 1200. From this condition the rational method, employing the Fanning formula, may be used:

$$\begin{aligned} \triangle P = P_1 - P_2 &= 0.00000336\ fLW^2v/d^5 \\ &= 0.00000336 \times 0.013 \times 10 \times (100{,}000)^2 \times 1.5684/32{,}380 \\ &= 0.212 \text{ psi} \end{aligned}$$

The designer and the operator usually wish to know the flow-loss characteristics over a nominal range of flow. Accordingly, Table 1 shows the data for flows of 20,000, 40,000, 60,000, 80,000 and 120,000 lb per hr, for a steam generator designed for 100,000 lb per hr continuous flow will usually deliver about 120,000 lb per hr for two or more hours and in usual practice it is found that flows as low as 20 per

Fig. 1—Viscosity of steam*



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*From Flow of Fluids Through Valves, Fittings, and Pipe, Technical Paper No. 409, Crane Co., May 1942, and based on latest determinations of Hawkins, Solberg, and Potter at Purdue University.

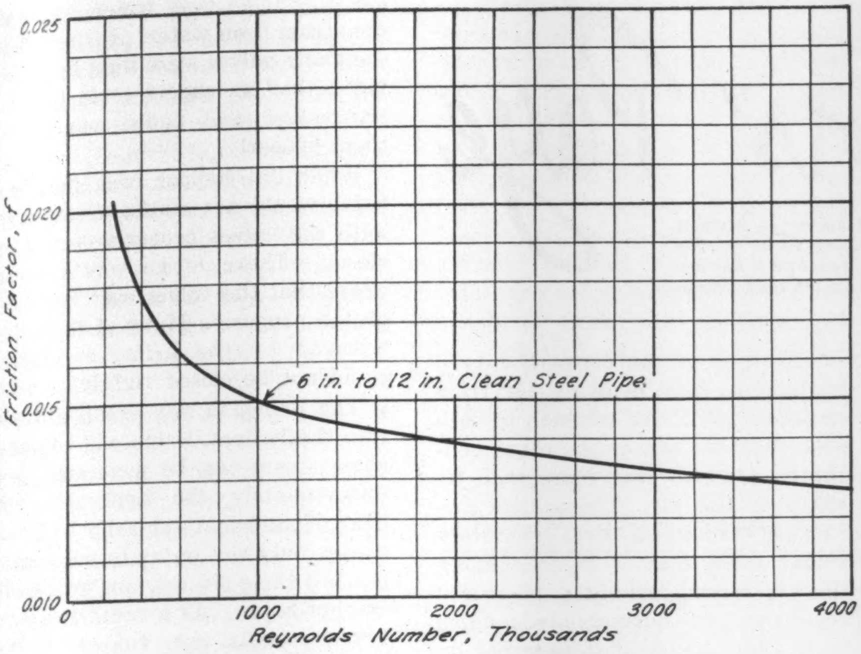

**Fig. 2—Reynolds numbers and friction factors for flow of steam in 6 in. to 12 in. pipe**

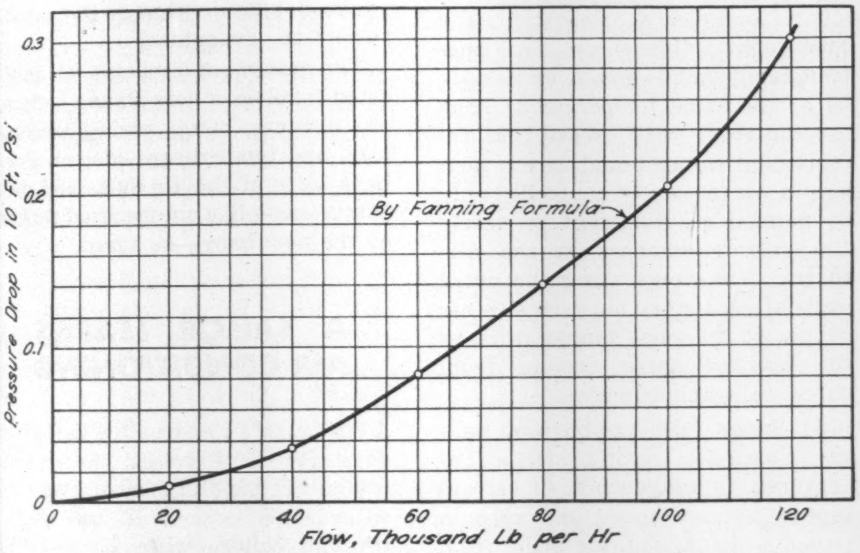

**Fig. 3—This plot of the data in Table 1 shows graphically that A. P. Steam loses energy at an accelerated rate the faster he and his brothers travel**

**Table 1—Pressure Drops for Various Rates of Flow**

| $W$ | $V$ | $\mu$ | $R_e$* | $f$ | $L$ | $\Delta P$ |
|---|---|---|---|---|---|---|
| 20,000 | 1505 | 0.026 | 609 | 0.0165 | 10 | 0.0108 |
| 40,000 | 3009 | 0.026 | 1,218 | 0.0145 | 10 | 0.0378 |
| 60,000 | 4514 | 0.026 | 1,827 | 0.014 | 10 | 0.0825 |
| 80,000 | 6019 | 0.026 | 2,436 | 0.0135 | 10 | 0.141 |
| 100,000 | 7524 | 0.026 | 3,045 | 0.013 | 10 | 0.212 |
| 120,000 | 9029 | 0.026 | 3,654 | 0.0128 | 10 | 0.301 |

*In thousands.

cent of continuous rating will be encountered.

Table 1 is shown graphically in Fig. 3. Thus we find by calculation that A. P. loses energy at an accelerated rate the faster he and his brothers travel. For instance, at 40,000 lb per hr the loss is virtually 3½ times as great as at 20,000 lb per hr flow. Considering this fact, it is obvious that pipe diameters must be selected carefully lest losses be excessive or investment too great because inadequate allowances were made for pressure drop.

**Nomenclature**

$A$ = cross sectional area of pipe, sq ft;
$a$ = cross sectional area of pipe, sq in.;
$d$ = internal diameter (ID) of pipe, in.;
$f$ = friction factor;
$L$ = length of pipe, ft;
$P$ = pressure, psig;
$P_1$ = initial pressure;
$P_2$ = final pressure;
$\Delta P$ = pressure drop or loss, psi;
$q$ = rate of flow, cu ft per sec;
$R_e$ = Reynolds number;
$v$ = specific volume, cu ft per lb;
$V$ = mean velocity, fpm;
$V'$ = mean velocity, fps;
$W$ = rate of flow, lb per hr;
$w$ = rate of flow, lb per sec;
$\mu$ (mu) = absolute viscosity, centipoise.

## STEAM-AIR JETS CUT RAILROAD SMOKE

A "simple twist of the wrist" is all it takes to reduce dense black smoke to an almost invisible haze when a railroad locomotive is equipped with modern, steam-air jets that furnish extra air over the fire to quicken combustion of volatile matter from coal, Bituminous Coal Research, Inc., the research agency of the bituminous coal industry, reported last month. The agency said that two dozen railroads, including many of the major lines of the country, have equipped 666 engines with jets and silencers patterned after the BCR jet design.

This appliance was developed by Battelle Memorial Institute and was demonstrated during a national meeting of the Smoke Prevention Association of America.

### "Turn of a Wrist"

As one observer reported, "Clouds of tarry, black smoke poured from the stacks of five locomotives standing on track 5 at Union station, obscuring the leeward yard and adding another black coat to the buildings and equipment. Then—with a turn of a wrist—the smoke was gone and only a light-tan haze appeared above the engines."

The "turn of a wrist" had turned on the steam-air jets, which are steam nozzles that propel extra air over the firebed as fresh coal is added.

# Sam Lewis' Page

**IN THIS regular feature, informal comment on heating, piping, and air conditioning matters is given by Samuel R. Lewis, consulting mechanical engineer, and a member of HPAC's board of consulting and contributing editors**

## EXAMPLE OF SOME THINGS TO AVOID

OCCASIONALLY THERE is encountered a plant that is interesting because it is an exhibit of many things that acceptable engineering should avoid.

Consider, for example, a multistory, completely air conditioned building used for offices and for selling merchandise—a department store. The building is exposed on four sides. The dimensions of each story are large; that is, there are extensive areas in the center that are more than 40 ft from any outside wall.

The commendable features are as follows:

1) Adequate refrigerating capacity is provided, using an acceptable refrigerant.

2) A mechanical draft cooling tower is on the roof, with facilities for employing the spent air from the exhaust system at about 80 F when the outside air is warmer than 80 F.

3) Distribution of the air supply is provided all the way across the building by symmetrical inlet diffusers, in no case more than 20 ft from any part of the floor area. The air supply apparatus is in a roof penthouse so as to take advantage of the truth that it is easier to deliver cool air downward than to force it upward from a cooling system located below the spaces that are to be served. (Warm air in winter may be forced downward with less reluctance than is exhibited by cool air that must be forced upward.)

There seem to be no other commendable features in this plant. The outstanding difficulties that might have been avoided, and that must be corrected, are as follows:

1) There are two duplicate air supply fans of the forward curved blade type, both drawing air from an intake and filter common to both—so that one fan or the other constantly tries to grab more than its share of the air. These fans discharge through a steel pipe convector more than 6 ft deep along the air stream giving a measured resistance at normal air volume more than double that required by commensurate finned convectors.

2) All of the air supply for all stories—regardless of their intensity of occupancy, orientation, and consequent differences in heat transfer demand—must, by design, be at the same temperature. Thus the top story with excess heat reception in summer and excess heat loss in winter can be controlled only by manual readjustment of nearly 100 volume dampers at the diffusers. The areas along the outer walls of each story must receive air supply at the same temperature as the interior areas remote from outer walls and windows.

3) Steam from gas burning boilers is used for heating, with a conventional arrangement of steam piping, vacuum traps, and vacuum pump. Calcium chloride brine from a conventional evaporator is pumped through the convectors for cooling. The same convectors, however, are used the year around for transferring the heat, with a complicated arrangement of manually operated valves whereby the brine was supposed to be shut off and drained at the end of each cooling season, and whereby low pressure steam was supposed to be turned into the former brine return main at the beginning of each heating season, while the condensate was supposed to be trapped out from the former brine supply branches and returned by the vacuum pump to the boilers.

This scheme might have worked had the brine been water, and had the steam been water, provided that the many valves were tight and provided that an expert could find all the valves and could manipulate them properly.

What did happen was that the brine would not all drain out, even with the valves properly opened or closed. There is no way now to prove that the valves ever were operated properly. Many of them, influenced by the brine, eventually could not be closed tightly.

The brine, in any event, did get into the boilers. Brine will boil and some steam can be generated, but unfortunately the application of heat of sufficient intensity to brine causes only the water to evaporate, leaving the solid calcium to incrust the hot boiler. As a result the boilers eventually were ruined. If the steam leaked into the brine system during the winter, the brine must have been considerably diluted and we do not know what is the condition of the evaporators.

The minimum replacement indicated involves a new plant—boilers, gas burners, pump, piping, convectors, and temperature control. Perhaps some of the air ducts and diffusers can—like the worried father of the new baby—be saved.

## A SAILOR LEARNS AIR CONDITIONING

I ENGAGED an apprentice the other day. He is a young sailor who served his time in combat zones as an ordnance expert. He was partly through college when he went to war, four of the good years of his life have been devoted to the preservation of all of us, and now he must catch up on his education.

He came to me seeking advice as to what college he should attend, since he had a very definite desire to specialize in what he called air conditioning, believing that his acquisition of this somewhat widely advertised art would permit him most rapidly to overtake the boys who stayed at home.

I explained to him that air conditioning in the popular sense would involve a reasonably comprehensive mechanical engineering education. A competent designer must know the laws of heat transfer, must be facile in handling mathematics, must know the lore of steam boilers, combustion of fuels and gases, and will encounter applications of hydraulics and electronics. He must know about fans, air ducts, and air distribution, and he must be able to increase or reduce the water vapor in the complex mixture of gases that we breathe. He must have a pretty thorough knowledge of air cleaning methods and equipment, and of odor control.

He will be very greatly aided if he has inspected many existing installations and if he can remember the things that should be emulated as well as those that should be avoided when designing similar plants. I explained that for summer cooling it is possible occasionally to employ cold water from a well or to evaporate water in an air current without employing any definite mechanical refrigeration.

He was made to appreciate that there is a large proportion of plants in which the heating apparatus may very well be a sort of byproduct of the cooling apparatus, utilizing the same pipes, valves, convectors, and automatic controls for introducing heat to as well as for removing it from a building.

I explained to the sailor some of the characteristics of deep well drilling and of ground water temperature and quality. I told him of the many cases in which a knowledge of sewers and sewage disposal enters into air conditioning. I delivered a short lecture on solar heat reception and on insulation to reduce heat transfer, and I outlined the research activities now under way on various sorts of windows. Before I finished I even scared myself by realizing the smattering of many trades that I have been acquiring.

I said to him: "Your ideas are commendable in that you wish to carry on your education intensively so as quickly to catch up. The government's idea in making you an allowance for this purpose is splendid. I think my own idea of cooperation with both yourself and the government is not too bad. So come here to my office and go to work at one-half the full rate I am paying fully experienced and competent engineers. You will be taught the business by actually doing the various operations. You will earn enough to support your wife and baby. The government allowance for education will allow you to attend night school to brush up on your mathematics and general culture. My own return will be selfish, since I will be training another assistant. We will both quickly learn whether you are a born engineer or a ribbon clerk, and mistakes can be corrected before they become serious."

P.S.—The boy is doing well.

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## PROPOSES SIMPLIFICATION OF REGULATING VALVES

A proposed simplified practice recommendation for automatic regulating valves has been submitted to producers, distributors, and users of these valves for approval or comment, according to an announcement of the division of simplified practice of the National Bureau of Standards, Washington 25, D. C.

Automatic regulating valves are used in industry for controlling the temperature, pressure, level, or rate of flow of fluids. The purpose of the recommendation is to establish as a useful standard of practice a simplified list of pressure ratings and sizes of seven types of these valves, made of steel, iron, and bronze.

The recommendation was developed in cooperation with a simplified practice committee of manufacturers, and if approved will retain on a voluntary basis the simplified practice features of a mandatory order which was effective during the war emergency.

Mimeographed copies of the proposed recommendation may be obtained from the division.

## YMCA OFFERS COURSES IN AIR CONDITIONING

Over a period of years the Dayton, Ohio, YMCA college has conducted courses in air conditioning and refrigeration, but during the war these courses were suspended. Due to the fact that the heating, ventilating, and air conditioning industry anticipates great activity, demanding large numbers of trained men, it was decided to explore and study the needs in order to determine definitely whether a program of study should be inaugurated.

As a result of this survey, it was felt that the college could offer basic training in heating, ventilating, and air conditioning on the basis of 64 semester hours of evening school work, available to qualified high school graduates. Later it was decided that a day program covering the same amount of training would also be needed, and that this training would prepare men for work at estimating and as application engineers.

The approved curriculum in air conditioning which was finally worked out has been designed primarily for students desiring to qualify themselves as estimators or application engineers. In addition to taking specific courses in air conditioning, work is also offered in electrical controls, a study of air conditioning systems, devices and types, and in the last semester there is a seminar where air conditioning students working on a specific problem are brought in contact with experts in the field of air conditioning. As a very necessary adjunct, courses in drawing, English, and mathematics are also included.

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## PASS ON HALF OF STEEL SHEET INCREASE

Resellers of flat galvanized steel sheets were authorized by the OPA November 29 to pass on to their customers one-half of the mill price increase of 20c per 100 lb which they have been required to absorb since the higher mill price was established on May 21. The action became effective November 30, 1945.

The increase in resellers' prices for flat galvanized sheets, OPA said, will enable warehouses and jobbers to obtain a trading margin over cost of 22.5 per cent, compared with approximately 20.5 per cent previously.

**WATCH FOR THE**
**DIRECTORY SECTION**
**NEXT MONTH!**

# Compression Distillation Shows Promise for Industrial Use

ALTHOUGH the compression principle of distillation has been known for many years, it was first developed to a point of large scale use during World War II for the U. S. armed services. After several years of wartime secrecy, the principles of this method were recently described by Allen Latham, Jr., in a paper presented at the annual meeting of the American Society of Mechanical Engineers last month. Mr. Latham directed much of the wartime work on this system, which was originally developed by a group headed by Dr. Robert V. Kleinschmidt (recently Commodore Kleinschmidt, USNR). Both of these men are associated with Arthur D. Little, Inc., Cambridge, Mass., where much of the development work was done.

### Navy Uses Thousands

Many thousands of these stills were used aboard naval vessels—submarines, destroyer escort, landing craft, and auxiliary vesels. On land, several thousand gasoline engine-driven, portable units were used, especially in the South Pacific, to supply our fighting men with fresh water where the sea was the only readily available source of water. By the end of the war there was enough of this type of compression distillation equipment in service to supply the daily needs of over a million men.

The operating principle of this method of distillation, as described by Mr. Latham, is based upon mechanical compression of steam or other vapor leaving the evaporation compartment. This compression raises the temperature of the steam a few degrees. At the increased temperature, the steam condenses at a temperature somewhat higher than the boiling point of the raw water, so that heat can flow from the condensing steam to the raw water and boil it. The condensing vapor is used to supply heat inside the steam chest of the still in lieu of steam from sources outside the unit. Provision for reducing heat loss to the atmosphere and recovering heat from the distillate and the concentrate carrying out waste completes the system.

After a compression still and its contents have come to operating temperature and the evaporator is filled with steam, the still may be turned on stream for continuous operation. In normal operation for the production of fresh water from sea water, for example, the feed enters by way of a triple passage heat exchanger which heats the feed by extracting heat from both the outgoing distilled water and from the brine concentrate which carries out the solids of the sea water in a concentrated solution. The feed at about 207 F is then introduced to the evaporator, where it mixes in a relatively large volume of brine which circulates naturally through vertical tubes. Steam from this boiling brine at, or slightly above, atmospheric pressure is led from the evaporation space through an entrainment separator to the compressor, which raises the pressure to about 3 psi gage, thus raising the temperature at which it condenses to about 222 F.

Since the brine in the evaporation space boils at 213 F, there is a temperature differential of about 9 F between the compressed steam and the boiling brine to permit transfer of heat from the former to the latter. Substantially all the latent heat, which is the heat given up by the compressed steam upon its condensation to water, is used in maintaining the necessary temperature level for continuous boiling in the evaporation space; thus no separate condenser or cooling water is required.

With a compression distillation unit of 1000 gal per day capacity, the production of 1 lb of distilled water requires about 20 watt-hours or 68 Btu's energy input.

### Wide Variety of Prime Movers

The author points out that a wide variety of prime movers for the compressor may be used and that most compression distillation equipment developed thus far has been in capacities less than 250 gph. Development of compression equipment for this purpose is by no means complete. Ordinarily the high quality standards for the distillate rule out the use of any lubricant in the compression space. This not only makes it impossible to use the most readily available types of compressors but also requires that the equipment be fitted with special seals to prevent the passage of lubricating oil into the compression space. Furthermore, the gradual rise in pressure caused by scale conflicts with the characteristics of centrifugal and axial flow compressors. Thus, the choice for many applications is generally narrowed down to positive displacement compressors which operate without oil in the compression space. It is believed that current developments of improved types of compressors may make a wider choice of compression distilling units possible in the near future.

By virtue of its low fuel consumption and its simplicity, this type of still—says the author—shows promise for industrial applications of distillation and evaporation, both of water and other materials. With wartime needs satisfied, the unit will be manufactured under license for sale to industry.

**This gasoline driven compression distillation unit produces 1800 gal of distilled water per day from sea water**

Heating, Piping & Air Conditioning

AMERICAN SOCIETY *of* HEATING *and* VENTILATING ENGINEERS

*Journal* *Section*

# Therapeutic Uses of Low Temperature

By Frederick M. Allen, M.D., New York, N. Y.

**SUMMARY—Intense heat always kills while intense cold may either destroy or preserve life. The author considers the effect of cold upon the entire organism; upon local parts; and upon isolated tissues. Local temperatures can be far lower than those which can be applied safely to the body as a whole, and consequently greater benefical effects can be obtained.**

**The use of low temperature, as a powerful therapeutic tool in various types of surgical uses, is illustrated by reference to several examples showing how local cooling has saved lives and limbs of individuals whose injuries would otherwise have been fatal.**

BY FAR the leading causes of death in the civilized world are the disorders of metabolism, which include diabetes and high blood pressure, both of them causes of arteriosclerosis. Although the author's field of work is this group of metabolic diseases and not surgery, a considerable number of deaths are due to arteriosclerotic gangrene of the feet, and experiments which were originally aimed at reducing the mortality from this cause have kept him occupied for a number of years with surgical problems of wounds and shock. But since metabolism comprises the total chemical processes of life, a wide range of studies concerning modifications of tissue metabolism by temperature still fall within the author's specialty.

If treatment of the subject begins fundamentally with the biology of temperature, it is large enough to occupy several volumes. Elevation or depression of temperature can harm or sometimes terminate life processes, but in general there is a contrast between the two directions. The upward range of endurable temperature is slight from the standpoint of a physicist. A few thermophile organisms such as some bacteria can survive temperatures close to boiling, but not far from that point all life is killed positively and beyond recovery. But on the downward range the physicist may be invited to do his worst; there is no universal killing by cold even at absolute zero; the stopping of life processes is reversible, or when death does occur it is often due to complicating factors.

One important complicating factor is hydration, conducing to the mechanical tearing of protoplasm by ice crystal formation. Therefore, organisms which are easily killed by cold when wet may be highly resistant when dry. Another variable is the capacity of protoplasm for supercooling, whereby not only low organisms but also the human skin may withstand temperatures 10 to 15 deg below the true freezing point without freezing. Another peculiar physical alteration is represented in the killing of some organisms at a few degrees below freezing and their survival if they are reduced rapidly to the temperature of liquid gases, because there viscosity or other protoplasmic changes prevent freezing. In general, resistance diminishes with ascent in the biological scale, but variations among species are enormous and unexplained. Among arthropods, contrary to popular belief, flies, ants, bees and all common insects are killed by very slight freezing, but tardigrades have phenomenal ability to survive the temperature of liquid hydrogen in either a wet or a dry condition. Reptiles, amphibia and fish also die with ordinary freezing. A popular error arises from the fact that a frog or fish may survive after being temporarily caught in ice, but if the body is frozen through, the heart is stopped and does not resume. Some tropical varieties are killed by chilling far above freezing, and the functional response to temperature varies extremely among different species. The metabolism of cold-blooded animals is

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typically accelerated by heat and retarded by cold, as evidenced by the active or sluggish behavior under the respective conditions. But fish such as the trout and salmon are intensely active in icy water which would halt muscular, nervous and glandular functions in most species. Since these fish also are killed by freezing, their thermal margin between optimal life conditions and death must be peculiarly narrow. Some microorganisms but no higher species are able to carry on life processes at temperatures appreciably below zero Centigrade, the lowest recorded limit being the growth of a fungus at —10 C (+ 14 F). Partial life functions in the form of enzyme activity can continue at various low temperatures not only in primitive but also in higher species, a familiar example being the *tenderizing* of mammalian muscle in prolonged refrigeration. Still another variable remains to be considered, namely, time, since very commonly a temperature which is endured for a short time becomes fatal in a longer time. This time factor appears strange if very low temperatures actually abolish all protoplasmic functions; but one of several hypotheses is that death results from the continuing activity of some enzymes or accumulation of their products.

The summary of everything is that while intense heat always kills, intense cold may either destroy or preserve life. The frigid zone of biology has fantastic possibilities. Bacteria are said to have been cultivated from inside the trunks of mammoths which had been frozen in the Siberian ice for thousands of years. There can be no positive denial of the speculation of Arrhenius that the primordial germs of life might have been carried to this planet from outer space through eons of time at the lowest limits of cold. But the topic requires a return to a concrete question: what is the relation of these diverse facts to practical medicine and the physiologic and pathologic processes with which it deals?

The effects of low temperature upon the highest species, including man, must be studied according to a threefold classification, namely, the effects upon the whole organism, upon local parts, and upon isolated parts.

### *Effects of Cold Upon Entire Organism*

For all homoiotherms or warm-blooded animals, there is an absolute low limit of temperature compatible with life. This ranges from about 13 C (55.4 F) in the rat to 22 C (71.6 F) in the dog. When the lethal temperature is reached even momentarily, there is a sudden stoppage of respiration, then of the heart, and there is no recovery upon warming. Hibernators retain the exceptional power of reverting practically to a cold-blooded behavior, with the characteristic torpidity on cooling, and some of them can withstand temperatures slightly below zero Centigrade, but freezing of vital organs is fatal. In all species the time factor is very important, all temperatures above the lethal point being tolerated for various times. There is roughly an inverse relation between time and temperature; the lower the temperature the more quickly it is fatal.

Any marked reduction of the body temperature of a warm-blooded animal is injurious and ultimately fatal. Therefore, defensive reflex mechanisms are active in combating any reduction. These include especially diminution of heat loss by constriction of superficial blood vessels and increase of heat production by the involuntary muscular activity of shivering. Dr. Temple Fay has reduced the human temperature to the lowest known limits, namely, to 24 C (75.2 F), which must be close to the lethal point. He was the bold pioneer discoverer of the torpid, almost unconscious state of *artificial hibernation,* which differs in important respects from true hibernation, and he can tell more about bodily hypothermia than anybody else. Only one central fact need be considered here. The utmost voluntary and involuntary efforts are justified to preserve body temperature, because of the ultimate fatal effect of reduction, but paradoxically these efforts may in themselves be fatal. Particularly by using sedatives to dull the reflexes and allow the body temperature to fall with a minimum of defensive reactions, Dr. Fay has been able safely to maintain rectal temperatures of 85 F or even lower for several days or a week, whereas a person exposed under ordinary conditions would die within a shorter time from exhaustion due to voluntary and involuntary efforts to prevent such a fall of temperature.

### *Effects of Cold Upon Local Parts*

Cold applied to a local area causes first a pallor due to vasoconstriction, with a tendency to reflex contraction of superficial vessels throughout the body. Later the local capillaries dilate, causing redness, though the larger vessels remain contracted. Sufficient intensity or duration of cold causes local edema, or wheal, and the *flare* described by Lewis is a surrounding redness due to capillaries dilated by formation of histamine-like substances in the tissues. Results are determined by the usual three factors of temperature, time and complications. Freezing with its crystal formation is particularly serious but by no means necessarily fatal, since a cat's leg has been experimentally frozen so hard that it would ring when struck and yet could recover with only brief inflammation and no permanent damage; and the similar survival of human fingers and ears after brief freezing is well known. The lowest temperatures kill tissues in the shortest time, but many persons will be surprised that such sensitive structures as liver and brain tissues and major blood vessels have been frozen for one minute with solid carbon dioxide without permanent damage. Important complicating factors are wetness, which when long continued can cause tissue changes even without severe temperature; also dependent position, obstructed circulation and nutritive deficiencies. Thus *immersion foot* occurs particularly in soldiers or sailors whose feet have been wet, cold, and in a cramped dependent position for several days.

After all these forms of injury, the first result of warming is a rush of blood. Then, in the severest cases, the arteries clot shut and necrosis of tissues from lack of blood is seen in the form of ulcers or gangrene. In less severe cases chronic nervous and circulatory disturbances persist for months, manifested by anesthesia, hyperesthesia, red, white or bluish mottled colors, and sometimes pain to a degree requiring amputation. Minor persistent lesions are familiar in the form of chilblains. After the mildest injuries, complete healing occurs more or less rapidly.

### *Effects of Cold Upon Isolated Tissues*

No formal distinction of this kind has heretofore been made in the literature, but there is a very sharp difference in behavior of tissues when they are removed from the nervous and circulatory control of the body. Evidently much of the local injury from cold represents a breakdown of defensive reactions. Not only are nervous and circulatory disturbances impossible but also the chemical response seems to be lacking, since tissues chilled outside the body do not excite the characteristic wheal and flare when reimplanted in the body. Also the tolerance of severe and prolonged freezing, such as would be unthinkable for any part connected with the body, proves that mammalian cells have by no means lost the resisting power inherited from primitive organisms. Thus cancer cells have survived freezing for two years. Human spermatozoa have regained activity after freezing at the nearest possible approach to absolute zero. More complex structures also reproduce the primitive behavior. Desiccation, which is considered most inimical to parts of the intact body, assists in the preservation of skin grafts for days or weeks at the temperature of solid carbon dioxide (Webster). The sensitiveness of blood vessels appears to be responsible for the necrotic effects of freezing, but large vein segments for surgical use are preserved for months at the same low temperature and do not then cause clotting of blood (Blakemore and Lord).

Much work will be required to determine what structures can be preserved, at what temperatures and for how long. In some instances, as mentioned, there is the paradox that temperatures near freezing may be more injurious than those far below freezing, perhaps because of irregular disturbances of cell enzymes. Limbs can be separated from their nervous and circulatory connections by a tight tourniquet, without amputation. Thus they will not display the defensive reactions of limbs which retain connections. Severe arteriosclerosis or wounds appear to make a partial change of this kind. It is not feasible to freeze or desiccate such limbs, but at least within a range from about 5 C (41 F) upward there is a reversal of the usual law. That is, tissues connected with the body are killed by the lowest temperature in the shortest time, but isolated tissues or limbs within the range mentioned survive longer in proportion as the temperature is lower. This survival can be very considerable, as the author was able to preserve ligated animals' legs in ice water for 54 hr, and Brooks and Duncan kept rats' tails for 96 hr. It is uncertain how much longer the survival might be possible if technical difficulties could be overcome.

## Therapeutic Uses

Considering these effects not as physiological curiosities but as powerful therapeutic tools, advance can be made far beyond the previous trivial uses of cold. The benefits of reduction of general body temperature should be left to Dr. Temple Fay for the most authoritative discussion. The author's impression is that the greatest usefulness exists in the treatment of shock, where the former tradition of warming patients has been reversed and a moderate reduction of both environmental and rectal temperatures is endorsed by all of the most recent investigators.

The author's own field of experience, namely local refrigeration, comprises far lower temperatures than can be applied to the body as a whole. The effects are correspondingly more powerful, within the local limitations. Obviously the chilling can be most radical and penetrating when blood flow is stopped by a tourniquet, but even without this aid experiments have proved that cold applied to the skin can produce considerable reductions of deep temperature, mostly by direct conduction but partly by reflex contraction of blood vessels. Refrigeration, halting all metabolism, places the tissues in a state of suspended animation, temporarily as reactionless as if they were dead. Thus it has the unique property of simultaneously inhibiting pain, shock, exudation, infection, necrosis, and formation and absorption of toxins. Hence it is used in a growing list of conditions which need one or all of these effects, as follows:

1. *Surgical anesthesia:* Cold is the only known anesthetic which anesthetizes not only nerves but also the entire protoplasm, and it thus provides the only shockless surgery. It was first used for this purpose, which was the origin of the research, namely amputation in dangerous gangrene cases, particularly those which were formerly given up as *inoperable* because of weakness and shock. The method consists essentially in applying a tight tourniquet of narrow rubber tubing well above the proposed level of amputation, the skin having been previously chilled to prevent pain from the compression. As soon as the tourniquet has been fastened, the entire limb is buried in ice to a couple of inches above the tourniquet. Any preexisting pain, even the most excruciating, ceases, and the patient is comfortable during the refrigeration period, which is the time required for cold to penetrate and deaden the deepest nerves. This time may range from one hour for an ankle to three hours for the thickest thigh. The ice is removed in the operating room and the amputation performed without pain or shock, the tourniquet being released just before final closure of the wound. Moderate cooling of the stump to a skin temperature of about 15 C or 59 F is continued for a day or two, to control pain, inflammation and possible infection or necrosis. Many surgeons have agreed that the mortality in poor-risk amputation cases has been greatly reduced by this method (in the City Hospital, N. Y., a change from about 80 per cent deaths to about 80 per cent recoveries).

2. *Infection and intoxication:* As an example a patient may enter the hospital nearly dead with infected gangrene. The leg is packed in ice. The intoxication is halted so that within 24 or 48 hr fever, delirium or unconsciousness are cleared up and the patient is eating. A tourniquet can be applied for still more absolute blocking of toxic absorption, and the amputation may be deferred for days or even weeks if necessary. Recently this method has been tried for other dangerous infections, especially gas gangrene, with encouraging results.

3. *Brief preservation after wounds:* As an example, a man may arrive in the hospital in a dying state after amputation of both legs by a railway train. He revives under transfusions and other treatments, and pain is re-

lieved by packing the stumps in ice. He is in condition for successful surgery 58 hours later, the wounds being fresh and free from odor. (Case of Dr. R. T. McElvenny).

4. *Prolonged preservation after wounds:* For example, if men sustain fractures of the pelvis by being crushed by trucks or falling from heights. In each instance the main artery of one leg is damaged and clotted shut. Amputation would be fatal in the presence of other severe injuries and shock. In cases reported packing in ice prevented gangrene of the leg for 2 or 2½ weeks while other injuries were being treated and strength built up; then amputation was followed by recovery. (Cases of Dr. H. E. Mock). A seaman on a destroyer had his femoral artery and vein severed in the upper thigh by a shell fragment. Refrigeration kept him comfortable and free from gangrene until amputation became possible after one month. (Case of naval surgeons Ottaway and Foote).

5. *Saving of limb:* A blast accident tore off one of a soldier's hands, mangled the other and inflicted body injuries. A quick wrist amputation might not have been fatal, but both forearms were packed in ice. After 2½ weeks there was sufficient recovery of strength for reconstructive surgery. The lacerated tissues were as fresh as at the time of the wound. One clean amputation was completed and the other hand was elaborately repaired so as to restore nearly normal function, thus avoiding *the horror of no prehensil limb.* (Case of Dr. I. M. Nachlas). Experimentally, it has already been proved possible to amputate a dog's leg, keep it in a refrigerator for 24 hr, and then restore it in position and usefulness. Future surgery may therefore hope to replace severed limbs, perhaps some time after the accident.

6. *Embolism:* Embolism in a limb means that an artery is stopped by a clot or other solid object carried to it from elsewhere. Thus it occurs in heart disease and other conditions where the patient may be unfit for immediate operation. Refrigeration has preserved such limbs from gangrene for 2 to 6 weeks, until conditions for amputation were more favorable. (Cases of Dr. L. W. Crossman).

7. *Shock:* In shock arising from crushing or other severe injuries of limbs, life may be saved by refrigeration, as proved definitely by animal experiments. This is part of the routine treatment of the *crush injury* which became familiar during bombing raids in England. Pressure by means of casts or tight bandages is commonly used for this same purpose, but though it is helpful for shock it does not control pain and may tend to increase tissue necrosis and infection. Cold can be used either alone or with pressure to obtain the combined effects.

8. *Injuries due to cold:* Frozen areas or "immersion foot" should not be warmed too fast or too far. Increase of pain, swelling, thrombosis and necrosis is the result. In the present war, Webster and other Canadian and English investigators learned that by keeping the affected parts moderately cool, with skin temperatures around 60 to 70 F, sometimes for several weeks, the neurovascular symptoms are greatly relieved and many amputations prevented. In the severest cases, a recent therapeutic advance is based on the previously mentioned fact that tissues are not directly killed by cold but die as a secondary result of thrombosis of vessels. The new treatment (Lange, Loewe and others) consists in preventing blood clotting by administering heparin for several days. The result is complete healing of frozen parts such as heretofore have become hopelessly gangrenous. But often it will be necessary to thaw the frozen parts at only a few degrees above freezing in order to prevent both thrombosis and necrosis in the interval before heparin can be obtained. Also the above-described need for cooling in the later stages is not altered.

9. *Burns:* Burns preeminently create a need for the unique potency of cold for controlling pain, shock, infection, necrosis and intoxication. Anybody can readily convince himself that the best emergency treatment is to plunge a burned part into the coldest obtainable water or apply ice. There is not only the best immediate relief of pain and inflammation but also the best influence on the subsequent course. While any other desired treatments may be combined with this, the later management includes moderate cooling for a number of days or weeks, somewhat as in frostbite cases. A recent case report by Dr. I. Kross* is part of the basis of hope that this method will revolutionize treatment and results in severe burns.

10. *Military surgery:* Obviously these enumerated types of injuries occur in war to the extent of thousands of cases. The weapons now in use have made limb wounds and burns particularly numerous. The examples from civilian surgery illustrate the value of refrigeration for painless and shockless transportation of wounded and for a wide variety of operations and treatments. Beyond question many lives and limbs have been lost as a result of the failure of the official scientific advisory committees to recommend methods and apparatus for this purpose. The arbitrary objection that refrigeration is not feasible near the fighting fronts has been answered by the refrigeration of food and drinks in advanced areas, the rapid transportation of wounded to equipped hospitals, and the actual use of the method on the initiative of medical officers with improvised apparatus. Tropical climate accentuates the need. Forthcoming reports will show the benefits thus derived from surgical refrigeration during the recent Pacific campaigns.

The preceding descriptions have been based mostly on the use of ice, which is the most primitive and still the most common method. Special apparatus is a convenience and in some respects almost a necessity for both civil and military treatments. Doubtless in this field there is more scientific interest than financial gain, and the machines of a manufacturer in Buffalo, N. Y., are the only ones now available. They circulate an alcohol-water mixture at selected temperatures through blankets, metal applicators or air chambers. Any such apparatus must be thoroughly constant and dependable in temperature, the automatic reliability being not only a therapeutic necessity but also an important saver of nursing work. Other desirable features are light weight, noiselessness, adaptability and minimum interference with a patient's comfort and movements. All these qualities are put to test in treatments requiring weeks or months of regulated temperature, for which ice bags are extremely inefficient and laborious. The existing apparatus has made possible the results obtained by the author in the City Hospital (New York), and apparently no more than minor improvements will be needed unless some radically new engineering principle comes into view. The author desires chiefly to leave the general conception of refrigeration as a scarcely explored borderland of suspended or modified vital processes, and to suggest the scientific and humanitarian benefits that can accrue if anybody in the industry concerned with production and control of low temperatures chooses to finance further investigations in this field.

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# A Single-Equation Design Procedure for Radiant Panel Systems†,

**By F. W. Hutchinson,***
**Lafayette, Ind.**

**SUMMARY—The author has reviewed the complex rational design procedure which was presented in a previous ASHVE paper, "Panel Heating and Cooling Analysis," and has developed a single-equation design procedure for radiant panel systems.**

THE RATIONAL design of a panel heating or cooling system involves consideration of many complicating factors which are neglected in the conventional design procedures for non-radiant systems. If adequate engineering accuracy can be obtained in a radiator, convector, or warm air installation which is designed without consideration of such exact rational relationships, one would reasonably expect that comparable accuracy could be obtained from a radiant panel design procedure which was based on the same assumptions. The purpose of the present study is briefly to review the complex rational design procedure which has been developed in a previous ASHVE paper[1] and to show, in a step-by-step development, the simplifications realizable from the rational equations if the assumptions underlying conventional non-radiant systems are applied to panel heating and panel cooling.

As will subsequently appear, the rational panel design procedure simplifies from a complex problem requiring simultaneous solution of a minimum of seven equations to the relatively simple task of substituting numerical design data into a single algebraic equation. The single equation is not linear and is somewhat unwieldy in form, but its solution involves no more than a routine substitution followed by arithmetical computation. Thus the problem of panel design is reduced to one of arithmetic which makes demands on the time but not on either the skill or judgment of the engineer.

In two respects, the single-equation solution possesses a simplicity and a generality greater than is found in the method of conventional design: (1) Both transmission and ventilation loads are included in the one equation. (In contrast to the procedure for convection design in which these two losses are separately computed.) (2) The comfort relationship is *built into* the equation so that the resultant design is in terms not of an arbitrarily selected inside air temperature, but rather of that particular *comfort air temperature* which is a characteristic of the particular heat transfer relationship of the given structure.

The principal disadvantage of the single-equation procedure is that numerical computations are tedious even though straightforward. The number and inter-relationships of the dependent variables are such that the equation involves addition and subtraction terms which necessitate at least three place accuracy. For the designer who works regularly with radiant panel problems, this disadvantage can be readily overcome by using the equation to establish generalized graphical solutions based on the outside design air temperature for the locality in question and for the fixed maximum permissible panel surface temperature (determined by the structural characteristics of the panel which is to be used). Brief consideration will demonstrate that a complete set of design graphs, based on the equation, could be established such that the problem of panel heating or cooling design could be readily carried out for any locality and for any type or location of panel; other than a determination of the equivalent overall coefficient of heat transfer for the room in question, no computations or reference to equations would then be necessary.

The body of this paper is divided into three parts: I. Critical review of the complex rational method of panel analysis with specific reference to the factors which are to be neglected. II. Development of the equivalent conductance concept and resultant reduction of the rational equations to simpler form and to lesser number. III. Simultaneous solution of the three basic equations eliminating the inside air temperature and inside unheated surface temperature as variables and leading to a single equation expressing the required panel area as a function of panel temperature and outside air temperature (known design constants) and the conductance and ventilation rate (constants of the structure).

## I. Analytical Procedure for Rational Panel Design

The rational procedure for design of a panel heating or cooling system consists in setting up a series of simultaneous heat balance equations; one equation for a heat balance on an average occupant (the *comfort* equation), one for a heat balance on the ventilation air passing through the room and *n* equations giving heat balances on the *n* unheated room surfaces which differ in construction, exposure, or orientation (with respect to the vertical). The heat balance on any infinitesimal area of inside unheated surface can be written in general and exact form as,

Radiation + Convection = Conduction

$$\sigma dA_m \sum_{n=1}^{n=\infty} K_{nm}\left[\left(\frac{T_n}{100}\right)^4-\left(\frac{T_m}{100}\right)^4\right] + h_m dA_m (t_a - t_m) = C_m dA_m (t_m - t_s) \qquad \ldots\ldots\ldots (1)$$

*where* subscript m identifies the infinitesimal area of inside surface on which the heat balance is established while subscript n (having an infinite number of point values) identifies each infinitesimal area of the enclosure other than the receiving surface. Further,

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[1] Panel Heating and Cooling Analysis by B. F. Raber and F. W. Hutchinson (ASHVE TRANSACTIONS, Vol. 47, 1941, p. 85.)

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$\sigma$ = Stefan-Boltzman constant = 0.173
$dA$ = an infinitesimal area
$T$ = surface temperature in deg F absolute
$t_a$ = inside air temperature, deg F
$t_o$ = outside air temperature, deg F
$t_m$ = temperature, deg F of, surface on which the heat balance is established
$h$ = film coefficient of heat transfer, Btu/(hr) (sq ft) (deg F); by convection only
$C$ = conductance of wall from inside surface to outside air, Btu/(hr) (sq ft) (deg F)
$K_{nm}$ = the fraction of radiant energy leaving $dA_m$ which is received by $dA_n$; by the reciprocity theorem, this is also equal to $\frac{dA_n}{dA_m}$ times the fraction of radiant energy absorbed at $dA_m$ of that leaving $dA_n$

In order to reduce Equation 1 to a form suitable for use in solving practical problems, means must be found in reducing the infinite series which constitutes the first, or radiation, term. A first step in this direction is to increase $dA_m$ to the largest permissible finite value $\triangle A_m$. Examination of the right side of Equation 1 shows that the conductance limitation on the receiving area is not serious since $\triangle A_m$ can be enlarged to a value equal to that of the area of any surface over which the conductance does not vary. Similarly, the convection limitation on $\triangle A_m$ can be determined by examination of the second term of the equation. From this term, it is evident that the receiving surface is limited to an area over which the inside film coefficient of convective heat transfer, $h$, remains constant. Actually, $h$ varies with the texture of the surface, the absolute surface temperature, the air-to-surface temperature difference, the air velocity, the proximity of other surfaces, and the aspect of the surface; in practice, however, the last factor—position of surface with respect to the air—is the only one that appreciably influences the film coefficient for the range of operating conditions that occur in comfort heating or cooling installations. As a first approximation, the film coefficient can be taken as 0.4 or 0.7 or 1.1, respectively, for a horizontal surface facing down (ceiling), a vertical surface, or a horizontal surface facing up (floor). Thus, combining the limitations on surface areas as imposed by conductance and convection, the maximum permissible value of $\triangle A_m$ would appear to be the largest section of homogeneously constructed and exposed structure which is found in ceiling, or wall, or floor. An ordinary room would, therefore, divide into six sections of surface consisting of exterior wall, unheated ceiling, inside partition, window area, floor, and panel; these areas will henceforth be designated by the subscripts w, c, i, g, f, p, respectively.

The foregoing discussion leading to a reduction in the number of values of n in Equation 1 from $\infty$ to 5 implicitly assumes constancy of temperature over each of the six basic surfaces of the enclosure. This assumption is incorrect for three reasons:

1. In the usual case, there will be a floor-to-ceiling air temperature gradient hence a floor-to-ceiling variation in surface temperature of walls and partitions. This variation is not taken into account in convective design procedure except through selection of a mean design value of the inside air temperature; since the gradient in a panel installation is usually less than for a conventional system, the justification for neglecting this variation in panel design seems evident.
2. Variation in point-to-point radiant exchange between the receiving area and the various other *unheated* surfaces of the enclosure. This factor appears, for example, in the local cooling effect experienced on a section of unheated ceiling which is adjacent to a wall in which there is a large glass area. The justification for neglect of this factor is not evident, but since it is neglected in conventional design (where its influence is equally as great as for radiant design) a similar assumption of unimportance will be made here.
3. Variation in point-to-point exchange between the panel and the receiving area. This factor may be of considerable importance in establishing marked temperature variation over a surface near the panel (as the upper third of a wall or partition adjacent to a ceiling panel) but it does not have controlling influence on surface temperature variations of average enclosure surfaces. In a room 20 ft x 20 ft x 10 ft, for example, the variation in direct irradiation received at points along an axis of the room from a heating panel occupying the entire ceiling would be approximately 30 per cent, but the maximum fraction of radiant energy leaving the ceiling and incident on a one square foot area centered on one room axis would be slightly less than 15/100 of one per cent; in general, this degree of irradiation would be small with respect to the convection and conduction transfers occurring from the same unit area.

In addition to the reasons given, neglect of temperature variation over each of the six basic surfaces can be further justified in that the assumed uniform temperature appearing in Equation 1 is a weighted mean value which reflects the influence of radiant exchange as given in the first term of Equation 1. Thus the calculated surface temperatures as used in panel design are not the same as those which would be found from a conventional analysis, but do take account of radiant exchange between the receiver and both the heated and unheated surroundings.

The remaining problem is to investigate the effect of the replacement of $dA_m$ by $\triangle A_m$ on the radiation coefficient $K_{n_1m}$. As previously defined, $K_{n_1m}$ represents a fraction of energy transfer based on the radiosity (emission plus reflection for an opaque surface) of the source and the actual absorption (rather than irradiation) at the receiving surface. But the radiosity of any area $\triangle A_{n_1}$ depends on its radiant exchange with each of the other surfaces of the enclosure. The transfer of radiation from $\triangle A_{n_1}$ to $\triangle A_m$ can occur directly, or after 1 to $\infty$ re-reflections between $\triangle A_{n_1}$ and $\triangle A_m$, or after 1 to $\infty$ inter-reflections among $\triangle A_n{}^1$, the n surrounding surfaces, and $\triangle A_m$; this latter fraction of energy will be received over an infinite number of paths and hence could be evaluated only if the geometry of the system were sufficiently simple to permit establishing boundary conditions for a series of integral equations. Thus, evaluation of $K_{n_1m}$ is not simple.

To assist in visualizing the factors which determine $K_{n_1m}$, note that the fraction of energy leaving $\triangle A_{n_1}$ in the direction of $\triangle A_m$ depends only on the geometrical arrangement of these two surfaces with respect to one another. The energy received at $\triangle A_m$ either direct from $\triangle A_{n_1}$ or after re-reflection between $\triangle A_m$ and $\triangle A_{n_1}$ depends on both the geometrical arrangement and the emissivities of these two elements of area. The energy received at $\triangle A_m$ after inter-reflection among the n-1 secondary surfaces depends on the factors given plus the geometrical arrangements and emissivities of all n-1 secondary elements of surface.

Fortunately, for the solution of practical problems, the emissivities of surfacing materials other than polished metal are so high (usually in excess of 90 per cent of black body) that less than 1 per cent of the initially emitted energy goes beyond a second reflection. Because of this rapid absorption of reflected energy, the assumption is commonly made that any enclosure which does not contain polished metal wall surfaces can be treated as though it were made up of non-reflecting materials. The effect of this assumption is to neglect the fraction of energy which reaches $\triangle A_m$ after re-reflection or inter-reflection, but to increase the energy reaching $\triangle A_m$ by direct transmission. Thus, two compensating departures from actual conditions are involved and the exactness of the approximation will obviously depend on the extent to which, for a particular installation, these two errors offset one another.

When the assumption previously discussed can be justified, the emissivities of the actual surfaces are no longer a factor in establishing $K_{nm}$ and, more important, the geometrical arrangements of the n-1 secondary surfaces do not enter into the evaluation of this constant. The only remaining factor influencing $K_{nm}$ and hence limiting the size of $\triangle A_m$ and $\triangle A_n$ is the geometrical arrangement of these two surfaces. For this special and simplified condition, the coefficient $K_{nm}$ is said to reduce to the shape factor, $F_{nm}$, of surface $\triangle A_n$ with respect to energy exchanged with $\triangle A_m$; this factor, based on the area of the surface m, is equal to the fraction of energy striking $\triangle A_n$ of that emitted by $\triangle A_m$ and can be shown[2] to be,

$$F_{nm} = \frac{1}{\Delta A_m} \int_{A_m} \int_{A_n} \frac{\cos\theta_n \cos\theta_m \, dA_m \, dA_n}{\pi r^2_{nm}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

*where:*

$r_{nm}$ = distance from $dA_m$ to $dA_n$

$\theta_n$ = angle between $r_{nm}$ and the normal to $dA_n$

$\theta_m$ = angle between $r_{nm}$ and the normal to $dA_m$

When the source and receiver areas are small the shape factor can be readily evaluated,[3] but for larger values of $A_m$ and $A_n$ the integrations often become difficult; for such cases the numerical values of shape factors can best be obtained from tabulations (for the more common surface arrangements) as given in standard references.[4,5]

Even with the assumption of an enclosure consisting of black body surfaces, the surface temperature will necessarily vary as a point function since $F_{nm}$ is a point function; however, the average value of $F_{nm}$ for a surface of finite area (as given in Equation 2) can be taken as constant over areas of moderate size and when so used in the heat balance equations will lead to values of the equivalent uniform temperature of each finite surface. For average design conditions in a panel heated or cooled room this series of equivalent temperatures will be adequate for use in computing the mean radiant temperature and hence in analyzing the performance characteristics of the system.

Before re-writing Equation 1 in terms of the six basic finite areas, it is helpful to define an equivalent first power coefficient of radiant transfer, $h_r$, which will permit writing the radiation term without the fourth power exponent. The radiation coefficient is an exact term defined by the equation,

$$h_r = \sigma \left[ \left( \frac{T_n}{100} \right)^4 - \left( \frac{T_m}{100} \right)^4 \right] + (t_n - t_m) \ldots\ldots\ldots\ldots\ldots (3)$$

For the range of temperatures customary in comfort installations, $h_r$ is practically constant and has a numerical value of approximately 1.08.

Now re-writing Equation 1 with the simplifying substitutions and in a form to give the heat balance on the exterior wall surface of a room,

$$1.08 \left[ F_{iw}(t_i - t_w + F_{pw}(t_p - t_w) + F_{cw}(t_c - t_w) + F_{gw}(t_g - t_w) + F_{fw}(t_f - t_w) \right] + h_w(t_o - t_w) = C_w(t_w - t_o) \ldots\ldots\ldots\ldots (4)$$

Equation 4 constitutes the basic form of surface heat balance equation as used in the previously proposed rational procedure for panel heating or cooling design. As already explained, similar equations must be set up for each different type of non-panel surface. Since in the average room there are five types of such surface and since the inside air temperature and the panel area (for an arbitrarily selected panel temperature) are additional unknowns, it follows that seven independent simultaneous equations must be written and solved. Any further simplification which can be realized from the rational procedure must therefore stem from an improvement in the form of Equation 4; this can most effectively be accomplished by use of the equivalent conductance concept as discussed in Part II.

## II. The Concept of Equivalent Conductance

Transmission losses from a convection heated room are usually calculated by an equation of the form,

$$q = \sum_{n=1}^{n=n} U_n A_n (t_a - t_o) \quad \ldots\ldots (5)$$

This equation can be re-written in the form

$$q = \left( \sum_{n=1}^{n=n} U_n A_n \div \sum_{n=1}^{n=n} A_n \right) \sum_{n=1}^{n=n} A_n (t_a - t_o) = U_e A_e (t_a - t_o) \quad \ldots\ldots\ldots\ldots (6)$$

*where* $A_e = \sum_{n=1}^{n=n} A_n$ = total unheated surface of the enclosure (inclusive of such non-transmitting surfaces as inside partitions but exclusive—in radiant systems—of the heating or cooling panel) and,

$U_e = \sum_{n=1}^{n=n} U_n A_n \div \sum_{n=1}^{n=n} A_n$ = the equivalent over-all coefficient of heat transfer of a homogeneous enclosure for which the total transmission losses would be identical with those of the actual enclosure. For an average room containing the five basic transmitting areas, the equivalent coefficient would be

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[2] Loc. Cit. See Note 1.

[3] Simplifying the Calculations for Exchange of Radiant Heat, by B. F. Raber and F. W. Hutchinson. (*Heating, Piping & Air Conditioning*, September 1944, p. 530.)

[4] *Scientific Basis of Illuminating Engineering*, by Moon (McGraw-Hill, 1936.)

[5] *Heat Transmission*, by McAdams (McGraw-Hill, 1942.)

$$U_e = \frac{U_fA_f+U_cA_c+U_wA_w+U_gA_g+U_1A_1}{A_f+A_c+A_w+A_g+A_1} \quad \ldots\ldots\ldots\ldots (7)$$

while for enclosures in which the temperature on the exterior of the transmitting surface has different values (as for attics, basements, or partially heated adjoining rooms) the equation would take the general form,

$$U_e = \sum U_nA_n(t_a - t_{o_n})/A_e(t_a - t_o) \quad \ldots\ldots\ldots (8)$$

where $t_{o_n}$ is the air temperature exterior to transmitting surface n.

The concept of an equivalent over-all coefficient does not reduce the work required for a non-radiant design, but it is of value in that it provides a single index which reflects the heat transfer characteristics of the structure independently of its size or exposure. Thus a comparison of the $U_e$ terms for any two houses will show immediately their relative thermal effectiveness.

When used in radiant design, however, the concept of an equivalent homogeneous enclosure leads to very great simplification. In such an idealized enclosure the surrounding surfaces consist of but two parts: (1) the panel; (2) the equivalent homogeneous unheated room surface. Thus, only one surface heat balance equation need be written and the number of simultaneous equations required for a solution is reduced from seven to three. Further, the panel in the equivalent room will necessarily be identical in size and temperature with the panel required for the actual room, but radiant exchange from the equivalent panel can be expressed in terms of the simple geometrical arrangement of a small surface completely enclosed by a large surface. For this case, the shape factor based on panel area is unity and based on area of the equivalent surround is equal to the ratio $A_p/A_e$. The equivalent homogeneous room visualization, therefore, serves both to reduce by more than one-half the number of equations needed, and to completely eliminate the task of evaluating shape factors.

A simplified form of Equation 4 can now be written as a heat balance on the homogeneous unheated (or cooled) surround,

$$1.08\ (A_p/A_e)\ (t_p - t_e) + h_e\ (t_a - t_e) = C_e\ (t_e - t_o) \quad \ldots\ldots\ldots\ldots\ldots (9)$$

*where* $C_e$ is the equivalent conductance of the enclosure and can be calculated from the equivalent over-all coefficient by the equation

$$C_e = \frac{1}{\dfrac{1}{U_e} - \dfrac{1}{1.65}} \quad \ldots\ldots\ldots\ldots (10)$$

The combined radiation-convection film coefficient (1.65) is used in Equation 10 because of the fact that this is the value used in computing the over-all coefficients which are listed in the HEATING, VENTILATING, AIR CONDITIONING GUIDE 1945. The film coefficient for convection only, $h_e$, will obviously have some average value dependent on the relative amount of enclosure surface which exists in wall, floor, and ceiling; since the range of this coefficient is from 0.4 to 0.8 to 1.1, a reasonable average value suitable for general use is 0.7 Btu/(hr) (sq ft) (deg F).

Substituting the numerical value of $h_e$ and letting $u$ and $v$ represent the fractions, respectively, of total enclosure surface which are panel or non-panel, Equation 9 becomes,

$$1.08\ u(t_p - t_e) + 0.7v(t_a - t_e) = C_ev(t_e - t_o) \quad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

The second of the three required simultaneous equations can be obtained by writing a heat balance on the ventilation air passing through the room,

Convection gain from panel—Convection to unheated surface = Energy gain of ventilation air

$$h_pA_p(t_p - t_a) - 0.7A_e\ (t_a - t_e) = 0.24W\ (t_a - t_o) \quad \ldots\ldots\ldots (12)$$

*where:*

$h_p$ = film coefficient of convective heat transfer from panel to room air

$A_p$ = panel area

0.24 = specific heat of air at constant pressure

$W$ = pounds per hour of outside ventilation air passing through the enclosure.

Re-writing Equation 12 in terms of $u$ and $v$,

$$h_pu(t_p - t_a) + 0.7v(t_e - t_a) = 0.24\ \frac{W}{A_p + A_e}\ (t_a - t_o) \quad \ldots\ldots (13)$$

Then letting $V_c = \dfrac{13.5\ W}{A_p + A_e} =$ cubic feet of outside ventilation air passing each square foot of inside surface per hour, and making this substitution in Equation 13,

$$h_pu(t_p - t_a + 0.7v(t_e - t_a) = 0.018V_c\ (t_a - t_o) \quad \ldots\ldots\ldots (14)$$

The third independent equation is an empirical one[6] which, in effect, sets up a heat balance on the occupant. In its most generally accepted form, this *comfort* equation is linear and can be written,

$$t_a = a - b\ \text{(MRT)} \quad \ldots\ldots\ldots (15)$$

*where* $a$ and $b$ are design constants which usually are assigned values of 140 and unity, respectively. The mean radiant temperature is a complex term,[6] but is frequently approximated as an average surface temperature,

$$\text{MRT} = ut_p + vt_e \quad \ldots\ldots\ldots\ldots (16)$$

thereby making it possible to write Equation 15 as

$$t_a = a - but_p - bvt_e \ldots\ldots\ldots\ldots (17)$$

Equations 11, 14, and 17 are the three independent simultaneous equations which must be solved in order to carry out a panel design by the method of equivalent conductance. The three unknowns which appear in these equations are the panel area, $A_p$, and the inside surface, $t_e$, and inside air, $t_a$, temperatures.

## III. A Single-Equation Solution for Panel Design

A simultaneous solution of Equations 11, 14 and 17 will eliminate $t_a$ and $t_e$ and give a resultant equation from which the unknown panel area, $u$, can be calculated in terms of known values of $C_e$, $V_c$, $t_p$ and $t_o$. If a panel area were initially assumed and the resultant design temperature, $t_p$, treated as the unknown, a more direct solution would be obtained since fixing the value of $u$ would at once fix the dependent variable $v$; for most practical problems, however, structural and economic considerations dictate the selection of $t_p$ as a design constant; structural in the sense that a fixed maximum value cannot be exceeded without hazard of cracking or disfiguring the panel and economic in that any design value of $t_p$ lower than the structural maximum will necessitate a larger and hence more costly installation. As a matter of arithmetical convenience, the solution which follows will be written in terms of the conductance.

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[6] Radiant Energy Exchange as a Factor in Airplane Cabin Heating, by B. F. Raber and F. W. Hutchinson (*Journal of the Aeronautical Sciences*, July 1944).

Solving Equations 11, 14, and 17 for $t_a$,

$$t_a = \frac{(1.08u + 0.7v + C_ev)\,t_e - 1.08ut_p - vC_et_o}{0.7v} \quad \cdots\cdots (11a)$$

$$t_a = \frac{0.7vt_e + h_put_p + 0.018V_ct_o}{h_pu + 0.7v + 0.018V_c} \quad \cdots\cdots (14a)$$

$$t_a = a - but_p - bvt_e \quad \cdots\cdots (17)$$

Equating 11*a* and 17 and solving for $t_e$,

$$t_e = \frac{0.7v\,(a - but_p) + 1.08ut_p + C_evt_o}{1.08u + v\,(0.7 + C_e) \;+ 0.7bv^2} \quad \cdots\cdots (18)$$

$$= \frac{v\,(a - but_p)\,0.7 + vt_oC_e + 1.08ut_p}{v\,(1 + bv)\,0.7 + vC_e + 1.08u} \quad \cdots\cdots (18a)$$

$$= \frac{0.7vK_1 + vt_oC_e + 1.08ut_p}{0.7vK_2 + vC_e + 1.08u} \quad \cdots\cdots (18b)$$

*where*

$$K_1 = a - but_p \text{ and } K_2 = 1 + bv \quad \cdots\cdots (19)$$

or

$$t_e = \frac{K_3 + vt_oC_e}{K_4 + vC_e} \quad \cdots\cdots (18c)$$

*where*

$$K_3 = 0.7vK_1 + 1.08ut_p \text{ and } K_4 = 0.7vK_2 + 1.08u \quad \cdots\cdots (20)$$

Equating 14*a* and 17 and solving for $t_e$,

$$t_e = \frac{(a - but_p)\,(0.7v + h_pu + 0.018V_c) - (h_put_p + 0.018V_ct_o)}{0.7v + bv\,(0.7v + h_pu + 0.018V_c)} \quad \cdots\cdots (21)$$

$$= \frac{v\,(a - but_p)\,0.7 + (a - but_p)\,(h_pu + 0.018V_c) - h_put_p + 0.018V_ct_o)}{v\,(1 + bv)\,0.7 + bv\,(h_pu + 0.018V_c)} \text{—}(21a)$$

$$= \frac{0.7vK_1 + K_1(h_pu + 0.018V_c) - (h_put_p + 0.018V_ct_o)}{0.7vK_2 + bv\,(h_pu + 0.018V_c)} \quad \cdots\cdots 21b)$$

$$= \frac{K_5 + 0.018V_c(K_1 - t_o)}{K_6 + 0.018V_cbv} \quad \cdots\cdots (21c)$$

*where*

$$K_5 = 0.7vK_1 + h_pu\,(K_1 - t_p) \quad \cdots\cdots (22)$$

*and*

$$K_6 = 0.7vK_2 + h_pubv$$

Equating 18c and 21c and cross-multiplying,

$$K_3K_6 + 0.018V_cbvK_3 + vt_oK_6C_e + 0.018V_cbv^2t_oC_e$$
$$= K_4K_5 \quad 0.018V_c(K_1 - t_o)K_4 + vK_5 \quad \pm 0.018V_c(K_1 - t_o)vC_e \quad \cdots\cdots (23)$$

Solving for $C_e$,

$$C_e = \frac{[(K_1 - t_o)K_4 - bvK_3]\,0.018V_c + (K_4K_5 - K_3K_6)}{[bv^2t_o - v\,(K_1 - t_o)\,]\,0.018V_c + (vt_oK_6 - vK_5)} \quad \cdots\cdots (24)$$

$$C_e = \frac{0.018V_c(K_1K_4 - t_oK_4 - bvK_3) + (K_4K_5 - K_3K_6)}{v[0.018V_c(bvt_o - K_1 + t_o) + (t_oK_6 - K_5)]} \quad \cdots\cdots (25)$$

*where* (as from Equations 19, 20, 22)

$K_1 = a - but_p$ $\quad K_3 = 0.7vK_1 + 108ut_p$ $\quad K_5 = 0.7vK_1 + h_pu(K_1 - t_p)$

$K_2 = 1 + bv$ $\quad K_4 = 0.7vK_2 + 108u$ $\quad = K_1(0.7v + h_pu) - h_put_p$

and $u + v = 1$ $\quad K_6 = 0.7vK_2 + h_pubv$

Equation 25 gives a panel design solution in a form equivalent to,

$$u = \theta\,(t_p, t_o, V_c, C_e, a, b, h_p) \quad \cdots\cdots (26)$$

*where*

$t_p$ = *a* design constant equal to the maximum permissible panel surface temperature which will occur at a time when the load on the system is greatest.

$t_o$ = design (minimum outside air temperature corresponding to a condition of maximum load on the system.

and $V_c$, $C_e$ are structural design constants fixed by thermal characteristics and ventilation (or infiltration) characteristics of the enclosure, while $b$ and $a$ are empirical coefficients of the comfort equation (usually taken as 140 and 1 respectively, and $h_p$ is the film coefficient of *convective* heat transfer from the panel and is constant at 0.4, 0.8, or 1.1 depending on whether the panel is located in ceiling, wall, or floor, and $K_1$, $K_2$, $K_3$, $K_4$, $K_5$, $K_6$, are arbitrarily defined parameters selected in order to reduce the procedure of computation to a direct and orderly basis.

For a given locality and a selected type of panel, Equation 26 reduces to the form,

$$u = \theta^1(V_c, C_e) \quad \cdots\cdots (27)$$

Equation 27 is obviously amenable to simple graphical solution and could readily be used as a basis for preparing sets of graphs which would reduce the problem of panel design to a routine matter of following a dashed line to the answer.

One advantage possessed by Equation 25 in the form in which it is written is that it provides a straightforward means of determining the boundary insulation requirements for an enclosure in a given locality which is to be heated (or cooled) by means of a particular type of panel. As an example, determine the maximum permissible equivalent conductance of a room 20 ft x 20 ft x 10 ft if it is to be heated by an all-over ceiling panel with maximum surface temperature of 100 F at a time when outside air temperature is 0 F; infiltration is taken as 1 air change per hour:

$$A_p = 20 + 20 = 400$$
$$A_p + A_e = 2 \times 20 \times 20 + 4 \times 20 \times 10 = 1600$$
$$u = \frac{A_p}{A_p + A_e} = 0.25$$

$$v = 1 - u = 0.75$$

$$V_e = \frac{(20 + 20 \times 10)1}{1600} = 0.25$$

$$t_p = 100$$
$$t_o = 0$$

$$a = 140$$
$$b = 1$$
$$h_p = 0.4$$

Then

$$K_1 = 140 + 0.25 \times 100 = 115$$

$$K_2 = 1 + 0.75 = 1.75$$

$$K_3 = 0.7 \times 0.75 \times 11.5 + 1.08 \times 0.25 \times 100 = 60.37 + 27.00 = 87.37$$

$$K_4 = 0.7 \times 0.75 \times 1.75 + 1.08 \times 0.25 = 0.919 + 0.270 = 1.189$$

$$K_5 = 0.7 \times 0.75 \times 115 + 0.4 \times 0.25 (115 - 100) = 60.37 + 1.50 = 61.87$$

$$K_6 = 0.7 \times 0.75 \times 1.75 + 0.4 \times 0.25 \times 0.75 = 0.919 + 0.075 = 0.994$$

and substituting into Equation 25,

$$C_{e(\max)} = \frac{0.018 \times 0.25 (115 \times 1.19 - 0 - 1 \times 87.37) + (1.19 \times 61.87 - 87.37 \times 0.994)}{0.75 [0.018 \times 0.25 (0 - 115 + 0) + (0 - 61.87)]}$$

$$= \frac{0.0045(71.32) - 13.22}{0.75(-62.39)} = \frac{12.90}{46.79} = 0.275;$$

*Then,*

$$U_e = \frac{1}{\dfrac{1}{C_e} + \dfrac{1}{1.65}} = \frac{1}{3.63 + 0.606} = 0.236$$

Since most rooms have a substantial fraction of total surface in the form of inside partition (with a consequent lowering of the equivalent over-all coefficient) it is evident that the calculated maximum value of $U_e$ for this case is sufficiently great to indicate the feasibility of ceiling panels for rooms meeting the conditions as given in the example.

## Summary

The assumptions and approximations used in setting up the simultaneous heat balance equations for the rational procedure of panel heating or cooling design have been considered critically and in detail. Based on these assumptions, a typical surface heat balance equation (4) has been written and the method indicated for establishing the six additional equations needed for an average design problem.

The concept of equivalent conductance was introduced and its use as a means of reducing the number of required simultaneous equations from 7 to 3 then demonstrated. Finally, the three equations for an equivalent homogeneous room were written and used simultaneously giving a single-equation (25) design procedure for determining by direct substitution the required size of a given type of panel for any particular enclosure.

Emphasis is placed on the fact that the single-equation solution is simple and direct even though the appearance of the equation is formidable and its numerical solution tedious. Once the design constants have been selected solution of the equation involves nothing more than routine substitution and progressive numerical condensation of the terms; this is a task which can readily be performed by unskilled personnel. Whenever the frequency of design problems is sufficient to justify an initial expenditure of time equal to that required for the solution of fifteen problems, it will be found economical as well as convenient to set up a graphical solution (for a given locality and given type of panel) of the basic equation.

### Acknowledgment

The author wishes to acknowledge with thanks his continued indebtedness for the advice, assistance and helpful criticism of Prof. B. F. Raber.

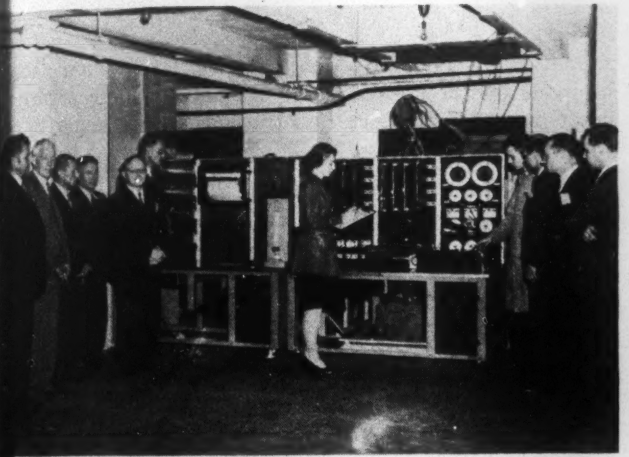
# MEMBERS INSPECT ASHVE RESEARCH LABORATORY

**October 8, 1945** **Cleveland, Ohio**

At the Registration Desk

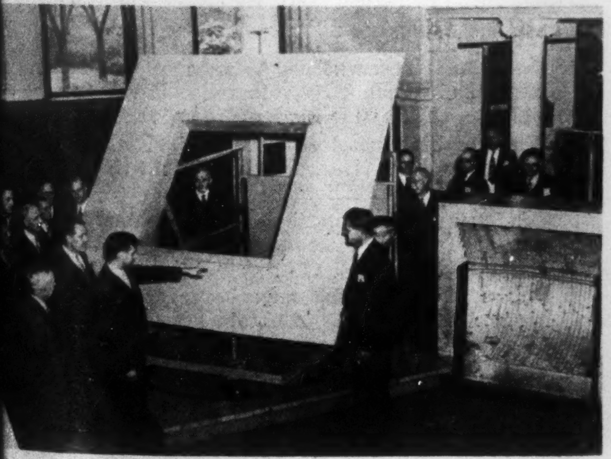
Research Laboratory, Cleveland, October 8, 1945

Joint Meeting of the Technical Advisory Committee on Air Conditioning in Industry and Committee on Industrial Hygiene. Left to right—W. N. Witheridge, W. C. L. Hemeon, L. L. Lewis, D. E. Humphrey, Dr. A. D. Brandt, Miss E. H. Manwell, W. L. Fleisher, Prof. F. W. Hutchinson



The instrument panel used in making heat transfer measurements on a flat plate

Meeting of Committee on Heavy Duty Furnaces. Left to right—R. S. Dill, Linn Helander, Bowen Campbell, E. K. Campbell, Miss I. M. Jahn, F. A. Kitchen, Frank Nunlist



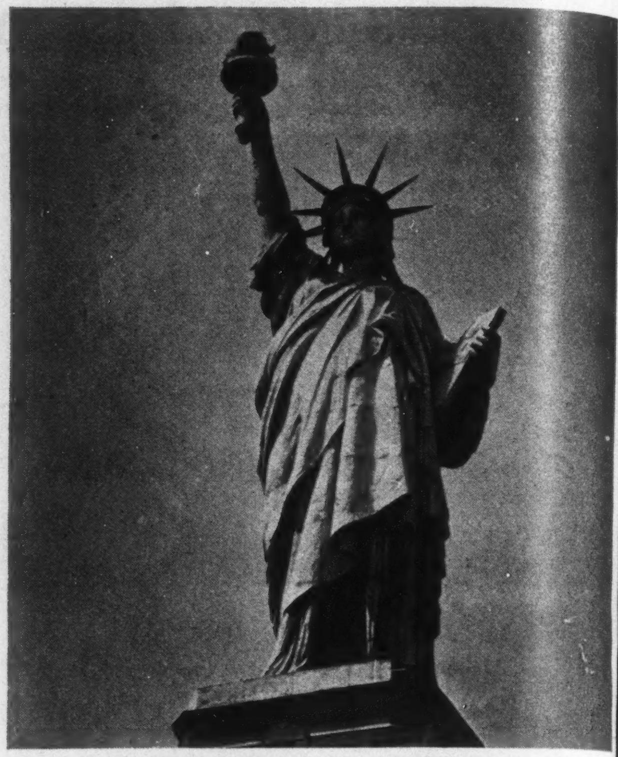
ewing the movable window frame used in the study of ar heat transmission through glass. (Heat absorbing unit in lower right is mounted on rear of frame)

Meeting of Technical Advisory Committee on Insulation. Left to right—C. A. Downing, R. K. Thulman, Comdr. E. R. Queer, H. E. Lewis, H. E. Robinson, T. D. Stafford

# New York for
# 52nd
# Annual Meeting
# ASHVE

at

## Hotel Commodore
## January 27-30, 1946



THE 52ND Annual Meeting of the Society will open in New York, N. Y., at the call of President C.-E. A. Winslow at 2:00 p. m., January 28, in Hotel Commodore.

Prior to the opening of the meeting there will be a Welcome Luncheon and a meeting of the Chapter Delegates on Monday morning, January 28, as well as other Committee meetings. The Committee on Research and the Council will hold their meetings on the 27th.

As the first session will be devoted to reports and discussion of the proposed revision of the Charter, with a report of the Constitution and By-Laws Committee on the nominating committee procedure and other amendments to the Constitution and By-Laws, it was the belief of the officers that the meeting in New York was desirable, and they are indebted to the New York Chapter for its gracious invitation to act as host.

R. H. Carpenter is the chairman of the Committee on Arrangements, which is now at work planning the entertainment program. Due to the crowded hotel situation, members are advised that a limited allotment of rooms has been secured and their reservation should be made on the special form provided. All reservations must be in 10 days prior to the meeting in order to get confirmation.

On Monday evening there will be an informal dinner party and entertainment, and on Tuesday the Annual Banquet will be held. There will be three technical sessions for the discussion of Research Laboratory and other papers.

A special committee for entertaining the ladies who attend, with Harry Wheller as chairman, is making plans for visits to places of interest, radio broadcasts, card party, etc. For the men, Chairman Pabst has arranged for several inspection trips.

The Committee on Arrangements is taking every precaution for the comfort of the members who attend the meeting, but because of present conditions of transportation and crowded hotel facilities, the following six suggestions are made:

1. Make hotel reservations as soon as possible, but not later than January 16, otherwise it may not be possible to obtain the kind of room requested.
2. When making hotel reservation indicate the approximate time of arrival, and if original time is changed be sure to notify hotel.
3. Sunday arrival is most desirable as arrival on Monday or Tuesday morning may result in a long wait for a room.
4. Railroad reservations may be made 14 days in advance, and it is wise to obtain accommodations before departure from home.
5. Whenever possible travel on off hour trains as the popular trains are usually overcrowded.
6. Travel with the minimum amount of baggage.

New York is adequately served by a great many railroads and air lines, and through sleeping car service is available from points over 450 miles.

**Committee on Arrangements**
R. H. Carpenter, *General Chairman*
*Vice-Chairmen*
M. C. Giannini
H. S. Johnson
W. E. Heibel
C. S. Koehler
H. J. Ryan
*Committee Chairmen*
*Banquet*—Alfred Engle
*Ladies*—H. S. Wheller
*Entertainment*—M. C. Giannini
*Publicity*—C. F. Roth
*Finance*—W. M. Heebner
*Sessions*—E. J. Ritchie
*Inspection*—C. S. Pabst
*Reception*—H. J. Ryan
Carl H. Flink, *Secretary*

# TENTATIVE PROGRAM

## 52ND ANNUAL MEETING

## AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

### January 27-30, 1946

**Hotel Commodore** **New York, N. Y.**

**Sunday, January 27**

| | |
|---|---|
| 0:00 a. m. | Meeting of Committee on Research |
| 2:00 p. m. | Meeting of Council (*Parlor C*) |

**Monday, January 28**

| | |
|---|---|
| 9:00 a. m. | REGISTRATION (*West Ballroom Foyer*) |
| 9:30 a. m. | Meeting of Chapter Delegates |
| 2:15 p. m. | Welcome Luncheon (*East Ballroom*) |
| 2:00 p. m. | BUSINESS SESSION (*West Ballroom*) |
| | Greetings |
| | Reports of Officers and Council Committees |
| | Reports of Special Committees |
| | Report on Revision of Charter |
| | Amendments to Constitution and By-Laws |
| | Report of Tellers of Election |
| 4:30 p. m. | Meeting of Nominating Committee |
| 6:30 p. m. | Past Presidents' Dinner |
| 7:00 p. m. | Informal Dinner Party (*East Ballroom*) |

**Tuesday, January 29**

| | |
|---|---|
| 9:00 a. m. | REGISTRATION (*West Ballroom Foyer*) |
| 9:30 a. m. | TECHNICAL SESSION (*West Ballroom*) |
| | A Study of Several Coal-Fired Magazine-Feed Space Heaters, by R. C. Cross |
| | Application of High Temperature Liquid as a Heat or Energy Transfer Medium for Domestic and Industrial Uses, by O. O. Oaks |
| | A Single Equation Design Procedure for Radiant Panel Systems, by F. W. Hutchinson |
| 2:00 p. m. | TECHNICAL SESSION (*West Ballroom*) |
| | Low Pressure Properties of Water from —160 to 212 F, by John A. Goff and S. Gratch |
| | Therapeutic Uses of Low Temperature, by Dr. F. M. Allen |
| | Heating and Ventilation of Transport Aircraft, by B. M. Brod |
| 7:00 p. m. | Annual Banquet (*Grand Ballroom*) |

**Wednesday, January 30**

| | |
|---|---|
| 9:30 a. m. | TECHNICAL SESSION (*West Ballroom*) |
| | Report of Committee on Research |
| | Branch Take-Off Design and Its Effect on Noise in Duct Ventilating Systems |
| | Combined Effect of Noise and of Hot Environments on Work Output |
| | Physiological Effects of High Effective Temperatures and Elevated Mean Radiant Temperatures |
| | Unfinished Business |
| | New Business |
| | Installation of Officers |
| | Adjournment |
| 12:30 p. m. | Council Luncheon Meeting (*Parlor A*) |

### Method of Choosing Location of, Financing and Conducting Meetings of the Society

*Resolved:* That inasmuch as the Annual and Semi-Annual Meetings of the Society come under the jurisdiction of the Council, the following rules governing the handling of such meetings be adopted by the Council and published in the Journal of the Society at least twice during every year, preferably just prior to each meeting.

1—The Council will select the city in which the Annual or Semi-Annual Meeting is to be held, giving due consideration to the invitations received from Chapters or members as well as to the advisability of so distributing those meetings as to make them of the greatest advantage to the general membership, and to reduce as far as possible the expense of members attending.

2—That an appropriation be made to cover the entertainment or local expenses, incurred in connection with the meeting not exceeding $500.00, the regular meeting expense to be taken care of by the General Fund of the Society in the regular way.

3—That no registration fee or compulsory obligations of any nature be imposed on members or guests.

4—That the purchase of tickets for banquets or for any other form of entertainment that may be provided be entirely voluntary.

5—That the grouping of features and the sale of tickets for group features be discouraged.

6—That the raising of funds from manufacturers of heating apparatus be discouraged.

7—That the display of samples, or of literature, advertising the product of any manufacturer in any way, shape or form, be not permitted at the booths, registration desk, or in or about the meetings.

8—That the distribution of trade papers be entirely at the discretion of the committee in charge.

9—That the local Chapter or local members be empowered to form a General Committee with such sub-committees as may be required to handle the details of transportation, hotel accommodations, entertainment, finance, etc., and that this General Committee be requested to confer frequently with the Council, through the Secretary of the Society, and to make frequent reports on progress in connection with the various matters being handled by them.

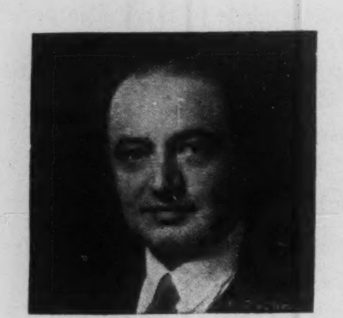
10—That the arrangements of elaborate and costly entertainment features be discouraged.

*Adopted at Council Meeting, January 29, 1926.*

# NOMINEES FOR 1946 OFFICERS

**For President**—Alfred J. Offner, consulting engineer, New York, N. Y., was born June 24, 1888. He was educated in New York and holds degrees in B.S. and M.E. from Cooper Union, where he taught advanced physics for five years.

He spent six years as draftsman and engineer with Konrad Meier, consulting engineer, and five years as engineer with Henry C. Meyer, Jr., consulting engineer. In 1919 he became senior member of the firm of Offner and McKnight, consulting engineers. In 1930 Mr. Offner opened his own office.



**Alfred J. Offner**

He was the consulting engineer for numerous governmental and private buildings located in various parts of the United States, Europe, South America, and in Asia.

Mr. Offner has taken an active part in the affairs of the New York Chapter, having served on the Board of Governors in 1928-29 and as its president in 1930. He was a member of the New York City Building Code Committee, and a member of the Building Laws and Regulations Code Committee in 1929. In 1930-31 he served on the Professional and Engineering Licensing Law Committee.

Mr. Offner has been a member of the Society's Council since 1935 and has been chairman of the Admission and Advancement Committee and chairman of the Regional Meetings Committee in 1938 and 1939. He was a member of the Guide Publication Committee for three years, being chairman in 1942. He also served as chairman of the Finance Committee in 1939 and 1940, as a member of the Executive Committee in 1941 and 1942, as a member of Council in 1943, serving on its Membership Committee, as Second Vice-President in 1943, and First Vice-President in 1944.

Mr. Offner has presented several papers before the Society and has written numerous articles on the subject of heating and ventilation for technical magazines.

Besides being a member of the Society, he is also a member of the *New York Association of Consulting Engineers,* serving as its president in 1936 and 1937.

⁂

**For First Vice-President**—B. M. Woods, Dir. of University Extension, University of California, Berkeley, Calif., was born in Lampasas, Tex., September 22, 1887. He received his degree of E.E. from the University of Texas in 1908, his M.S. in electrical engineering in 1909, and his degree of Doctor of Philosophy in 1912. He has been associated with the University of California for 35 years.

During the years 1921-1923 he was Director of the Summer Session at the University of California at Los Angeles, and from 1923 to 1925 was Assistant Dean of the University. From 1924 to 1930 he was Associate Dean of the University and Representative in Educational Relations. In 1930 he was appointed to the chairmanship of the Mechanical Engineering Department, and in 1942 became Director of the University Extension.

In 1936 Dr. Woods took a year's leave from the University to accept appointment in Washington, D. C., with the National Resources Committee as Consultant in a Survey of Federal Research in the United States. Returning to the University, he maintained relations with the National Resources Planning Board, serving as chairman of the region covering California, Arizona, Nevada and Utah until it was dissolved by an Act of Congress in 1943. He served as president of the American Society of Planning Officials in 1943, as a member of the National Advisory Committee on Engineering, Science and Management War Training of the U. S. Office of Education, and numerous others.

Dr. Woods, in collaboration with colleagues, has written a book on engineering economy, one on the dynamics of airplanes, and has contributed many miscellaneous technical and non-technical articles to various publications.

**B. M. Woods**

He is also a member of the *ASME, SPEE,* a fellow in the American Association for the Advancement of Science, an honorary member of the Air Conditioning Society of San Francisco, a founder member of the Institute of the Aeronautical Sciences, etc., Sigma Xi, Tau Beta Pi, Eta Kappa Nu and Phi Delta Kappa.

Dr. Woods was instrumental in organizing the Golden Gate Chapter of the ASHVE, and served as its first president in 1937. He has been a member of the Society's Council since 1942, and served as Chairman of its War Service and Finance Committees in 1944 and 1945.

⁂

**For Second Vice-President**—G. L. Tuve, Case School of Applied Science, Cleveland, Ohio. Professor Tuve was born on May 26, 1896,

G. L. Tuve

Canton, S. D., where he attended Public School and Augustana Academy. He attended Augustana College, Sioux Falls, S. D., Northwestern University, Evanston, Ill., and received his B.S. and M.E. from the University of Minnesota, Minneapolis, Minn., in 1920 and 1921.

Since receiving his degrees in mechanical engineering he has specialized in heating, ventilating, air conditioning, heat transmission and air flow. His industrial experience has been with the Public Service Co. of Northern Illinois, the Allis-Chalmers Mfg. Co., the American Locomotive Co., and others. After spending some time on the staff of the University of Minnesota he became Assistant Professor of mechanical engineering at the University of Montana, and later became Professor and Head of the Department of Mechanical Engineering at Texas Technological College.

For the past two years Professor Tuve has been chairman of the Society's Committee on Research, and has served on its Council for five years. Since joining the ASHVE in 1932 he has served on many of its Research Technical Advisory Committees, as a member of the Meetings, Nominating, Standards, and Guide Publication Committees, and has contributed numerous papers which appear in the Society's Journal and Transactions. In his affiliation with the Northern Ohio Chapter, Professor Tuve served on the Board of Governors for a number of years and as its president in 1936.

Professor Tuve is co-author with Prof. C. F. Shoop of a text book entitled *Mechanical Engineering Practice*, now in its 7th printing, and used by about 30 engineering colleges. He has been a contributor to Marks' Mechanical Engineers Handbook and to many technical publications. Professor Tuve is also a member of the *ASME* and the Society for Promotion of Engineering Education, Sigma Xi and Tau Beta Pi.

∴

**For Treasurer**—John F. Collins, Jr., Pittsburgh, Pa. Mr. Collins was born on March 25, 1895, in Pittsburgh, and following his graduation from the public schools in that city and after a short interruption due to World War I, he received his B.S. and C.E. degrees in 1919 from the University of Pittsburgh, School of Engineering.

Mr. Collins spent several years with Morris Knowles, Inc., consulting engineers, and for a period of 17 years was employed by the subsidiaries of the Philadelphia Co., supplying gas, light and steam in Pittsburgh, which ended in August 1939, when he became secretary-treasurer of the *National District Heating Association.*

In recent years he successively held the positions of supervisor of Steam Distribution and supervisor of Steam Utilization with the Allegheny County Steam Heating Co., the steam subsidiary of the Philadelphia Co.

J. F. Collins, Jr.

Mr. Collins is the author of several papers on district heating; served as president of the Pittsburgh Chapter of the Society in 1938, and from 1942-1945 served as a member of the Society's Council, as chairman of both its Finance Committee and Chapter Relations Committee in 1943, a member of its Membership Committee in 1944 and its chairman in 1945, chairman of the Joint Committee on Weather Statistics, and a member of the Research Technical Advisory Committee on Heat Requirements of Buildings.

## C. W. STEWART APPOINTED VICE-PRES. THE CLARK MFG. CO

Appointment of Charles W. Stewart, prominent in the steam specialty sales field for many years, as Vice President in Charge of Sales is announced by the President of The Clark Manufacturing Co. of Cleveland, 1830 East 38th St., Cleveland, Ohio, manufacturers of steam specialties and Clark fluid controls.

C. W. Stewart

Mr. Stewart has served as President of the *Steam Heating Equipment Manufacturers Association* since 1942 and has been a member of the American Society of Heating and Ventilating Engineers since 1919.

For the past 18 years Mr. Stewart has been associated with the Hoffman Specialty Co., Indianapolis, as Zone Manager, Assistant General Sales Manager and, more recently, as Vice-President in Charge of Sales. He was also a director of the company.

In his connection with The Clark Manufacturing Co., Mr. Stewart will work closely with Vice-Pres. John L. Mainwaring in extending the sales and distribution of the company's products nationally.

## HEAVEN ENGRG. MOVES TO NEW QUARTERS

According to a recent announcement of Lewis P. Heaven, the Heaven Engineering Co., 1330 Broadway, Kansas City 6, Mo., is now located in their own building at 1525-29 Wyandotte St. Both the enlarged office and the engineering department will permit the company to serve the territory to greater advantage.

The company also announces that the Springfield, Mo., office and warehouse, located at 322-24 Boonville St., is now open for business.

# SUMMARY OF LOCAL CHAPTER MEETINGS

Central Ohio—November 19. Subject: Outside Type Building Controls. Speaker: Henry T. Kucera, Pres., Automatic Devices, Inc., Chicago. A question and answer period of unusual interest followed Mr. Kucera's talk. Attendance, 33. Attendance ratio, 0.42.

Central Ohio—October 10. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, President of ASHVE, New Haven, Conn. The Chapter was honored by the presence of Dr. Winslow, and before giving his talk he discussed several matters of mutual interest to the National Society and the Central Ohio Chapter. A letter from the St. Louis Chapter and the reply by the Committee on By-Laws were read and discussed, and motions were made covering these. Attendance, 51. Attendance ratio, 0.55.

●

Cincinnati—November 13. Subject: Design of Air Vents on Heating Systems. Speaker: Ferdinand Jehle, Dir. of Engrg., Hoffman Specialty Co., Indianapolis, Ind. He illustrated his talk with slides which showed actual working models on the screen. The audience was interested to learn that an air valve must be designed and does not just happen. A lively discussion followed. Attendance, 18. Attendance ratio, 0.35.

Cincinnati—October 9. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, President of ASHVE, New Haven, Conn. Dr. Winslow also outlined the present and future activities of the ASHVE. Following Dr. Winslow's talk a lively discussion took place, with requests for additional data, particularly from the guests from the U.S. Public Health and the City Health Division. Attendance, 51.

●

Delta—October 9. Subject: Advancement in Refrigerants. Speaker: Frank D. Graham. Mr. Graham's talk was well received, and the applause following his talk, which he illustrated with slides, indicated the interest of the group. W. H. Grant, Jr., and J. S. Burke, president and secretary of the Chapter, were elected to serve as Chapter Delegate and Alternate at the next Annual Meeting. L. V. Cressy introduced E. R. Foss, treasurer of the Atlanta Chapter, who spoke briefly on State and Government codes and restrictions affecting engineering practice. President Grant appointed a Research and Coordinating Committee composed of A. M. Hill, chairman, C. B. Gamble and G. C. Kerr, to develop air conditioning research in New Orleans. Attendance, 25. Attendance ratio, 0.45.

●

Golden Gate—October 3. Subject: Panel Heating Systems. Speaker: Bob Bruen. Mr. Bruen brought out the practical information on this subject, and mentioned that the cost of a good panel heating installation was usually considerably less than for a first class steam or hot water job. He explained that the heating coils may be installed in the floor, sidewalls or ceiling with uniform temperatures throughout the room, except in ceiling panels where there is a layer of comparatively high temperature for about 6 in. below the ceiling, but from there to the floor there would be less than 2 deg difference in the room temperature. Mr. Bruen showed many interesting photographs of actual jobs in course of installation and sections indicating how the heating coils are placed. After his talk there were numerous questions, showing interest felt by the members and guests. Attendance, 56. Attendance ratio, 0.66.

●

Illinois—November 12. Subject: Fundamental Types of Fans. Speakers: G. A. Mathis, New York Blower Co.; T. J. Mullen, B. F. Sturtevant Co.; J. W. Muessig, Clarage Fan Co.; C. A. Pickett, Herman Nelson Corp.; N. P. Runge, Clarage Fan Co.; and J. F. Tobin, American Blower Corp. Their talks covered paddle wheel types, forward curved fans, backward curved design, propeller fans, axial flow designs, and installation and maintenance. Slides illustrating characteristics of the various fans and their installation were shown. Attendance, 104. Attendance ratio, 0.60.

Illinois—October 8. Subject: Dehumidification of Air by Means of Dehydrating Agents. Speakers: H. W. Heisterkamp, Bryant Heater Co., spoke on silica gel; H. F. Zankey, Pittsburgh Lectrodryer, discussed activated alumina; and F. M. Johnson, Surface Combustion Corp., described lithium chloride. The three speakers agreed that chemical dehumidification should be considered on every air conditioning job where relative humidities at or below the comfort zone values are desired, and that the lower the required humidity, the more importance should be attached to this method. Each of the speakers described and illustrated the equipment available for the respective methods, showed flow diagrams, and cited typical installations. Following the talks, written questions from the audience were answered by the speakers. Attendance, 108. Attendance ratio, 0.65.

●

Indiana—November 2. Subject: The Engineered Btu's Effect on Political Forces. Speaker: Brig.-Gen. W. A. Danielson, U.S.A., Memphis, Tenn. The secretary reported that without doubt the evening was one of the most thought provoking sessions the Chapter has had since the Smoke Abatement Meeting. The General's talk was followed by a lively discussion period. Attendance, 46.

●

Iowa—November 13. Subject: Zero Differential Control of Warm Air Furnaces. Speakers: Messrs. Rodge

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Note. The attendance ratios shown above represent the meeting attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Booth and John W. Norris, officers of the Lennox Furnace Co. The speakers reported that their past experience in the industry had convinced them that it was necessary to provide constant fan operation for forced warm air heating systems in order to provide maximum comfort. Mr. Norris led a discussion regarding the application of warm air furnaces and particularly stressed the location of supply and return air registers. Following the question and answer period, the members and guests were taken on an interesting inspection tour of the Lennox Furnace Company's plant. Attendance, 33.

◆

IOWA—October 9. Subject: Climatic Conditions in India. Speaker: Prof. W. C. Thoburn, Iowa State College, Ames, Ia. Professor Thoburn outlined the research work he had done in India to determine the most practical and feasible methods for heating and cooling. He stated that he conducted experiments to determine the amount of heat stored in the earth by locating thermocouples 20 ft deep and measuring the temperatures at that depth as compared to surface temperatures. The purpose of these experiments was to find out if excavations of this type can be used to reduce the temperature of air being circulated by circulating it through the pit and then into the building in order to accomplish a certain amount of comfort cooling. Attendance, 20.

◆

KANSAS CITY—November 5. Subject: Performance of Radiant Baseboards in the I-B-R Research Home. Speaker: Prof. Warren S. Harris, University of Illinois. Professor Harris gave a complete story of the tests made on baseboard heating in the I-B-R Research Home. He supplemented his talk with slides. Other features: J. M. Arthur and D. M. Allen were appointed as representatives on the Kansas City Technical Council. Attendance, 77.

◆

MANITOBA—October 18. The meeting was given over to the discussion of a number of subjects, the first being the question of attendance, which resulted in the President agreeing to contact the Attendance Committee with a view to increasing the attendance. The Program Committee discussed the arrangements for the special meeting planned for November. Attendance, 8.

MANITOBA—September 25. Subject: Fans and Ventilation. Speaker: W. Caldwell, Sales Mgr., Sheldons, Ltd., Galt, Ontario. Mr. Caldwell illustrated his talk with slides. Attendance, 13.

◆

MASSACHUSETTS—October 16. Subject: Chemical Cleaning of Heat Exchange Equipment. Speakers: L. E. West, Dist. Development Engr., Dowell, Inc., subsidiary of Dow Chemical Co., Philadelphia, Pa., assisted by W. E. Bisler of the same company. Attendance, 27. Attendance ratio, 0.36.

MASSACHUSETTS—May 22. Subject: The National Fuel Efficiency Program. Speakers: Max Seltzer, Seltzer and Co., co-ordinator for Boston area, and Kenneth M. Waddell, Assist. Supvr. of the National Fuel Efficiency Administration. Other Features: A. V. Hutchinson, Secretary of the ASHVE, gave a brief talk on the Society, pointing out the close relationship between the Society and the U. S. Bureau of Mines, and to what extent the Society is cooperating with the Federal Government. Mr. Hutchinson also called attention to the fact that the Society now has over 4,000 members. Attendance, 35. Attendance ratio, 0.47.

◆

MEMPHIS—November 12. Subject: Proper Engineering of Radiant Heating Systems. Speaker: H. A. Lockhart, Bell and Gossett Co., Morton Grove, Ill. Mr. Lockhart reviewed progress in the application of this method of heating from the earliest crude applications to the more recent and prominent installations. He devoted a long period to answering the numerous pertinent questions directed by his listeners. Other Features: E. E. Scott, chairman of the finance committee, submitted his report, followed by a report by the membership committee chairman, F. H. Bigelow. Pres. T. J. O'Brien requested consideration of nomination of chapter delegate for the next Annual Meeting of the Society. J. J. Nolan was elected as delegate, and W. E. Thorpe as alternate. Attendance, 23. Attendance ratio, 0.85.

◆

MICHIGAN—November 12. Subject: Technical and Research Activities of the Institute of Boiler and Radiator Manufacturers. Speaker: J. F. McIntire, Pres., U. S. Radiator and Past President of ASHVE. Mr. McIntire's very interesting talk dealt with the gradual growth of committees formed among boiler and radiator manufacturers until a boiler testing code has been produced that benefits the entire industry. He answered many questions put to him, and was accorded a hearty vote of thanks. Other Features: Pres. R. F. Cornell read a letter from the District Fuel Ration Officer, Detroit Branch of the OPA, in which he thanked the members of the Michigan Chapter who had worked with the Fuel Oil Rationing Boards in an advisory capacity as heating engineers. The letter pointed out that the fuel oil rationing program would have been seriously handicapped without the help rendered by the Society members. Reports were received from the various committee chairmen. Attendance, 55. Attendance ratio, 0.44.

◆

MICHIGAN—October 15. Subject: Automotive and Aviation Heat Transfer Surface Development. Speaker: L. P. Saunders, Treasurer of the ASHVE, and Chief Engr., Harrison Radiator Division, General Motors Corp., Lockport, N. Y. Mr. Saunders illustrated his talk with lantern slides, which he used very effectively. A rising vote of thanks was extended to Mr. Saunders for his very enjoyable talk. Attendance, 65. Attendance ratio, 0.53.

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MINNESOTA—November 5. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, Pres. of ASHVE and Dir. of John B. Pierce Laboratory of Hygiene, New Haven, Conn. Before beginning his talk, Dr. Winslow made some remarks on the growth and condition of the Society and the goals for 1946. His talk was illustrated with slides, and held the interest of the audience. Other Features: Pres. R. E. Gorgen brought forth a recent announcement from the Society headquarters concerning the 1946 Annual Meeting, and gave the nominees for the various offices. He emphasized the nomination of M. S. Wunderlich as one of the nominees on the Council. F. W. Legler announced that the Manitoba Chapter would like to resume joint summer meetings with the Minnesota Chapter such as were held a few years ago. President Gorgen then read an announcement from Society headquarters stating that the Society would like to purchase a limited number of 1944, 1943, and 1942 Guides. Attendance, 61.

MINNESOTA—October 15. Subject: What's Coming in Air Conditioning and Refrigeration. Speaker: George F. Taubeneck, Editor, Air Conditioning and Refrigeration News, Detroit, Mich. He stressed the commercial possibilities of a number of pre-war products as well as some items which were not so common before the war. He also mentioned a new and somewhat little known phase of refrigeration, that of the use of refrigeration in the treatment of disease. Other Features: The ASHVE members and friends were guests of the Minnesota Chapter of the *ASRE*. Pres. J. F. Raether of the Minnesota Chapter *ASRE* opened the meeting and introduced the Society officers, as well as the *ASRE* officers. Attendance, 137.

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MONTREAL—November 19. Subject: Heating, Ventilating and Air Conditioning in Latin American Countries. Speaker: A. J. Offner, Consulting Engr. and First Vice-Pres. of ASHVE, New York, N. Y. Mr. Offner's talk was illustrated with slides and was followed by a brief question period. Other Features: A Nominating Committee was appointed, F. A. Hamlet, Chairman, John Colford and A. E. Watts. Attendance, 37. Attendance ratio, 0.50.

MONTREAL—October 15. Pres. A. B. Madden announced that there would be no guest speaker due to the great number of business items to be discussed, but three films were shown: There Is an Engineering Reason (Yarnall Waring Co.); The Fulton Expansion Bellows (Fulton Co.), and The Bell Helicopter (Bell Aircraft Co.). Attendance, 30. Attendance ratio, 0.33.

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NEBRASKA—November 14. Subject: Atomic Bomb Research. Speaker: Dr. William K. Noyce, University of Omaha. Dr. Noyce devoted a short period to answering many questions. The entire meeting was devoted to Dr. Noyce's talk. Attendance, 25.

NEBRASKA—October 15. Subject: Housing Research—An Aid to the Heating and Ventilating Engineer. Speaker: Carl F. Boester, Dir., Housing Research Division, Research Foundation, Purdue University, Lafayette, Ind. A short period of discussion followed Mr. Boester's talk. Attendance, 25.

NEW YORK—October 15. Subject: Fundamentals of Nuclear Physics. Speaker: Prof. John R. Dunning, Columbia University. Professor Dunning's talk covered the basic principles of atomic disintegration. A lively discussion period followed. In a rising vote of thanks to Professor Dunning the members voted this to be one of the best meetings held by the New York Chapter. Attendance, 160. Attendance ratio, 0.71.

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NORTH TEXAS—October 3. Subject: Heating, Ventilating and Air Conditioning in Latin American Countries. Speaker: Alfred J. Offner, Consulting Engr. and First Vice-Pres., ASHVE, New York, N. Y. Mr. Offner's talk covered economic and industrial phases of the various countries, which he illustrated with slides showing the different types of heating and air conditioning used, various design temperature problems, etc. An interesting discussion followed. Other Features: Pres. E. T. Gessell then appointed the nominating committee consisting of L. S. Gilbert, L. C. McClanahan and T. H. Anspacher. Attendance, 35. Attendance ratio, 0.63.

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NORTHERN OHIO—November 12. Subject: Conduit Weathermaster System of Air Conditioning System. Speaker: H. C. Hoffmann, Carrier Corp. Mr. Hoffmann described the functions of each of the five basic parts of the system, the central primary air unit, primary air distribution, weathermaster units, water cooling units, and water distribution. He described the system as being applicable to a multi-room and multi-story building having a low latent heat load where individual room control is necessary. Other Features: Reports were submitted by the President, Vice-President, Treasurer, Secretary, and by the chairmen of the Membership, Program and Publicity Committees. Attendance, 75. Attendance ratio, 0.53.

NORTHERN OHIO—October 8. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, President of Society and Dir., John B. Pierce Laboratory of Hygiene, New Haven, Conn. Dr. Winslow's talk was very ably presented and held the interest of those present. An active discussion period was held following his talk, followed by a rising vote of thanks to Dr. Winslow. Other Features: This was the first regular meeting of the 1945-46 season, and the chapter was host to the Society's Council and the committee members who attended the official inspection of the Society's Research Laboratory. G. B. Priester presided over the afternoon session, at which three technical papers were presented. This was followed by a social hour in the Pine Room of the Hotel Statler. After the dinner in the Euclid Room at the Statler, Mr. Priester opened the meeting by welcoming the out-of-town visitors and introducing L. T. Avery, who was toastmaster of the evening. Attendance, 140. Attendance ratio, 0.71.

NORTHERN OHIO—September 21. The annual fall golf party was held at the Elyria Country Club, with golf in the afternoon, dinner at 8:00 p.m., and entertainment by the Ohio Bell Telephone Company Quartet.

OKLAHOMA—October 2. Subject: Heating and Air Conditioning in South American Countries. Speaker: Alfred J. Offner, First Vice-President of ASHVE, and Consulting Engr., New York, N. Y. Mr. Offner's talk was well received, and an active interest was displayed in both requirements of heating and air conditioning in South American countries. A period of discussion followed with questions and answers pertaining to Mr. Offner's experiences in South America. Attendance, 26. Attendance ratio, 0.82.

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ONTARIO—November 5. Subject: Climatic Elements Related to Building Research. Speaker: J. A. Gray, Dir. of Building Research, Dept. of Reconstruction, Ottawa, Ontario. This was a joint meeting with the Royal Meterological Society, Canadian Branch. Other Features: Introduction of guests by W. H. Evans. Report on membership drive by William Philip, chairman of membership committee. Announcement of Annual Meeting in New York, January 28-30, 1946. V. J. Jenkinson was appointed chairman of On-to-New York committee. H. R. Roth reported on the recent Council Meeting in Cleveland. Attendance, 104. Attendance ratio, 0.43.

ONTARIO—October 1. Subject: A Heating Man in Munitions. Speaker: E. Holt Gurney, Past President of ASHVE, and President of The Gurney Foundry Co., Ltd., Toronto, Ont., Canada. Other Features: Cyril Tasker, Director of Research of ASHVE, Cleveland, Ohio, spoke on the Society's activities in research during the war. Prof. G. L. Tuve, Chairman of Committee on Research of ASHVE, and Professor of Heat-Power Engrg., Case School of Applied Science, Cleveland, Ohio, delivered a talk on the present research activities of the Society. Attendance, 84. Attendance ratio, 0.45.

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PACIFIC NORTHWEST—October 9. Subject: Housing Research—An Aid to the Heating and Ventilating Engineer. Speaker: Carl F. Boester, Dir., Housing Research Div., Research Foundation, Purdue University, Lafayette, Ind. Other Features: Pres. D. C. Griffin outlined the duties of the local committee chairmen for the coming year and announced the chairmen and committees as follows: W. E. Beggs, Admission; J. D. Sparks, Attendance; W. E. Barnum, Jr., By-Laws; J. H. Faulkner, Entertainment; E. H. Langdon, Finance; S. D. Peterson, Inter-Chapter; R. O. Wesley, Membership; E. L. Weber, Program; Prof. E. O. Eastwood, Vice-Chairman of Program Committee; C. W. May, Public Relations; and R. D. Watt, Research. Attendance, 47.

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PHILADELPHIA—November 8. Subject: Heating, Ventilating and Air Conditioning in Latin American Countries. Speaker: Alfred J. Offner, Consulting Engr. and First Vice-President of ASHVE, New York. A great deal of interest was shown among the members at the discussion period following Mr. Offner's talk. Attendance, 67.

PHILADELPHIA—October 11. Subject: Application of Copper Tubing to Radiant Heating. Speakers: S. R. Osborne and R. G. Vanderweil, both of Chase Brass and Copper Co., Waterbury, Conn. A great deal of interest was shown among the members at the discussion period after the lecture, which the speakers illustrated with slides. Attendance, 103.

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PITTSBURGH—November 12. Subject: Aviation and Automotive Heat Transfer Surface Development. Speaker: L. P. Saunders, Treas. of ASHVE, and Chief Engr., Research Engrg., Harrison Radiator Div., General Motors Corp., Lockport, N. Y. Mr. Saunders opened his remarks with the cooling effects of the automobile, the radiators used in tractors, tanks, and then airplanes. He showed slides to illustrate the results obtained under different conditions. An interesting discussion followed Mr. Saunders' talk. Other Features: J. F. Collins, Jr., reported on the By-Laws and Constitution Committee, and then announced that the Annual Meeting would be in New York in January. T. F. Rockwell spoke on the refrigeration code for the city and its adoption. It was decided that L. S. Maehling appoint a committee to sponsor the code. Attendance 26. Attendance ratio, 0.31.

PITTSBURGH—October 8. Subject: Centrifugal Refrigeration. Speaker: J. R. Chamberlain, Asst. Chief Engr., York Corp., York, Pa. Mr. Chamberlain dealt with the development of centrifugal compressors and the refrigerants used with this type of compressor. He also spoke about the economy as compared with radial or reciprocating types. During his talk he showed slides which brought out different high points, and an interesting discussion followed. Pres. L. S. Maehling introduced Mr. Hoyt, President of ASRE, who expressed the hope that the two chapters would continue the practice of joining together for meetings. Attendance, 48. Attendance ratio, 0.31.

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ROCKY MOUNTAIN—November 16. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, Pres. of ASHVE and Dir., John B. Pierce Laboratory of Hygiene, New Haven, Conn. Before starting his lecture, Dr. Winslow stated that the present research program called for an estimated expenditure of three-quarter million dollars, and that the Public Health Department will assign a man to the ASHVE Laboratory to aid in industrial health research. Dr. Winslow defined the primary objects of air conditioning as the provision of an environment which will permit the human body to lose the heat produced in the life process at such a rate as to keep the body at its normal temperature. He discussed studies showing the effects on the body, of humidity, convection, radiation and metabolism, and the complex way in which the human body responds to environments that are too hot or too cold. He also pointed out that the effects of heat and cold on mental alertness are an important consideration, and that without any air conditioning in the Pacific War

Theater about one-third of the men became emotionally unstable within six months. Other Features: Pres. G. D. Maves called for the reports of the various committees, Membership, Program, Finance, Attendance and Legislative. Attendance, 30. Attendance ratio, 0.48.

**Rocky Mountain**—October 12. Subject: Housing Research—An Aid to the Heating and Ventilating Engineer. Speaker: Carl F. Boester, Dir., Housing Research Riv., Research Foundation, Purdue University, Lafayette, Ind. He pointed out the need for research and the need of financial support of the Research Committee, and that low-cost housing is virtually nonexistent, thus making it difficult for the 85 per cent who earn less than $2,500.00 per year to own homes. Mr. Boester predicted decentralization of dwellings and development of units that would make the home largely independent of community utilities. He also discussed radiant and reflective heating and pointed out that mean radiant temperature is the important thing. Other Features: Pres. G. D. Maves called for nomination of a five-man committee to nominate officers for the next season, and the following were elected: Messrs. J. H. McCabe, T. P. Jones, P. L. Rice, E. J. McEahern, F. L. Trautman. President Maves then announced the appointment of the various committees for the coming year. Attendance, 32. Attendance ratio, 0.51.

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**St. Louis**—October 2. Subject: Automatic Heat Must Provide Comfort. Speaker: F. J. Nunlist, Jr., Chief Engr., L. J. Mueller Furnace Co., Milwaukee, Wis. He explained the necessity of correct engineering for the installation of forced circulation warm air heating systems, as well as gravity warm air heating systems. He also emphasized the importance of the control system and the design of the heating plant being synchronized for satisfactory operation. Following his talk, Mr. Nunlist led a general discussion and answered various questions pertaining to the engineering of warm air heating systems. Attendance, 81.

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**South Texas**—November 16. Subject: Psychology and the Thermostat. Speaker: F. C. McIntosh, Mgr., Pittsburgh Branch, Johnson Service Co. A short discussion followed Mr. McIntosh's talk. D. S. Cooper reported on the work of the Code Committee. Attendance, 34.

**South Texas**—October 4. Subject: Heating, Ventilating, and Air Conditioning in Latin American Countries. Speaker: A. J. Offner, Consulting Engr. and First Vice-Pres. of ASHVE, New York, N. Y. Mr. Offner's talk proved interesting and informative and held the interest of the members and guests. A short discussion followed. Attendance, 41.

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**Southern California**—October 10. Subject: Reconversion Problems Confronting Los Angeles. Speaker: Earl S. Anderson, Los Angeles Chamber of Commerce. Mr. Anderson told how these problems could be coped with and what the scheduled building program is for Los Angeles and vicinity. He pointed out that industry's demands for labor in this area would easily counteract any layoffs. At the same time, he emphasized the point that Los Angeles is not soliciting the immigration of additional workers because of the terrific housing shortage in this area. It is estimated that the housing capacity is now taxed to 106 per cent. He presented figures on federal, state, and local funds set aside for work in this area and elaborated on the proposed extensive free way systems to eliminate some of the congested traffic conditions and mentioned the possibility of a downtown airport. He concluded his remarks by saying that in order to meet the housing demands Los Angeles may expect a building program such as it has never before experienced. Mr. Anderson painted a very rosy picture for the heating and air conditioning business in the area, and his very informative and well presented talk was appreciated by every member. Attendance, 51.

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**Utah**—November 15. Subject: The Air Cooled Human Body. Speaker: Dr. C.-E. A. Winslow, Pres. of ASHVE, and Dir. John B. Pierce Laboratory of Hygiene, New Haven, Conn. Dr. Winslow opened his remarks by outlining briefly the activities of the Society, summarizing the splendid accomplishments of the Committee on Research, which is doing a great deal for the heating, ventilating and air conditioning industry. He then proceeded with his talk, bringing out many new aspects affecting the comfort of the individual. He indicated the need for comfort and how it improved the efficiency of an individual, thus making it possible for him to be more productive. He also indicated a need for more and better planning on the part of the heating, ventilating and air conditioning engineer. Dr. Winslow's address was well received by all present, who felt it was a real pleasure to have Dr. Winslow as their guest. Attendance, 39. Attendance ratio, 0.55.

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**Utah**—October 10. Subject: Research Activities in Relation to Post War Housing. Speaker: Carl F. Boester, Housing Research Executive, Purdue Research Foundation, Purdue University, Lafayette, Ind. Mr. Boester, in spite of the adverse circumstances of his plane arriving late, favored the group with a very interesting, informative and enlightening talk on research activities, relative to the post war housing program. He projected his thinking far into the future with respect to new features, developments and possibilities awaiting the energetic thinking heating and ventilating engineer. The Chapter members were sorry that Mr. Boester did not have more time to spend with them as he seemed to have an unlimited source of information to draw from that was very interesting and valuable. The enthusiastic applause received by the speaker was indicative of the enjoyment of those present.

The following were elected to serve on the Nominating Committee: E. V. Gritton, D. B. Holford, J. L.

Ashton, R. C. Brown, and D. R. Wilde. Attendance, 41. Attendance ratio, 0.68.

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WASHINGTON, D. C.—November 14. Subject: Pentagon Building. Speaker: C. S. Leopold, Consulting Engr., Philadelphia, Pa. Mr. Leopold gave a very interesting talk describing the air conditioning system in the Pentagon Building and the problems connected with the design and operation. Many unusual features were pointed out by Mr. Leopold, and a lengthy discussion followed his talk. Other Features: The secretary read an account of the presentation of a resolution to Mrs. Mattie L. Houghten, honoring the late Commander Ferry C. Houghten. Lieut. Comdr. S. L. Gregg, chairman of the Constitution and By-Laws Committee, reported that the report was still incomplete but would be ready for the next meeting. A. C. Crawford, chairman of the License Bill Committee, submitted a report on the progress of the Bill. Attendance, 76. Attendance ratio, 0.40.

WASHINGTON, D. C.—October 10. Pres. W. H. Littleford announced that a film on the History of Radio Broadcasting would be presented through the courtesy of Westinghouse Electric and Mfg. Co. in place of the usual talk. W. C. Jones, chairman of the Membership Committee, gave a report on plans for membership activity for the coming season. F. B. Sale suggested that the Chapter contact members who have returned from military service and welcome them back and invite them to the meetings. L. B. Nye, Jr., suggested that the Secretary write a letter inviting returned members to meetings, and Mr. Jones proposed that the Attendance Committee contact each member returned from service, which was agreed to. Attendance, 39.

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WESTERN MICHIGAN—November 5. Subject: Society Research, Its Past, Present and Future. Speaker: Cyril Tasker, Director of Research, ASHVE Research Laboratory, Cleveland. Mr. Tasker pointed out that during the war much international cooperation in research took place, research for superior weapons of war. Now cooperative research is much more necessary to provide a better standard of living. Mr. Tasker also pointed out that money spent for research is a very sound investment. It is putting money to work with the least risk and pays back with the highest profits. He further stated that research conducted in cooperation with colleges and universities pays big dividends because at least $4.00 worth of work is done for every $1.00 spent. He explained that the Research Laboratory does no commercial testing and does not carry on any secret or private project. He also pointed out that more than $50,000 a year will be necessary in order to effectively carry on a progressive research program. Mr. Tasker hoped that industry would see the value of cooperative research and invest some of its money in the Society for that purpose. Slides were shown of the Laboratory in Cleveland and of the work that is now being done on the study of glass film coefficients and on solar radiation. An interesting period of discussion followed. Other Features: Announcement of the 52nd Annual Meeting to be held in New York, January 28-30, 1946, was made. T. D. Stafford gave a complete report on various phases of the Cleveland Conference held in connection with the Fall Council Meeting of the Society and the official inspection of the Research Laboratory. Attendance, 37.

WESTERN MICHIGAN—October 8. Subject: Planning and Estimating of an Air Conditioning System for a Four-Story Office Building. Speaker: J. N. Livermore, Mech. Engr., Detroit Edison Co., Detroit, Mich. Actual experience, he stated, has shown that 366 tons of refrigeration will do the work, after taking into consideration building and occupancy changes. A number of slides were shown to illustrate load changes, etc. Other Features: As an added feature for the evening a color film illustrating the Bell Helicopter in flight was shown. Program Chairman J. W. Miller announced the tentative meeting dates for the season. It was suggested that any available copies of the ASHVE GUIDE be given to H. D. Bratt so that he could forward them to the Secretary of the Society for shipment to the Netherlands. Attendance, 50.

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WESTERN NEW YORK—October 8. Subject: Radiant Heating. Speaker: C. A. Hawk, Jr., Application Engr., A. M. Byers Co., Pittsburgh, Pa. Mr. Hawk held the attention of his audience by presenting a story of romance in radiant heating, tracing back the history to the Roman Empire. He brought the topic up-to-date by presenting slides of recent installations of various applications. He threw the meeting open for questions and during the following 90 minutes was kept busy by the members and visiting architects. The Western New York Chapter reported that it had never witnessed such intense interest in a topic under discussion and it was with regret that the meeting adjourned at 10:30 p.m. Attendance, 56. Attendance ratio, 0.60.

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WISCONSIN—October 15. Subject: Automatic Heat Should Provide Comfort. Speaker: F. J. Nunlist, Jr., Chief Engr., L. J. Mueller Furnace Co., Milwaukee. Mr. Nunlist delivered an extremely interesting talk, stressing the fact that, to provide comfort it is necessary to modulate heating input, either on an actually modulated basis or on an average performance basis. Mr. Nunlist explained that with continuous fan operation it is possible to obtain much better ventilation results than with intermittent performance, and consequently, it is possible to obtain identical ventilation results by using continuous fan operation at a slow fan speed rather than intermittent fan operation at high fan speed. He also advocated some kind of control of the gas cycles which would let them parallel actual heat losses from the house. An interesting and enlightening discussion followed Mr. Nunlist's talk. Attendance, 47. Attendance ratio, 0.61.

### PAST PRESIDENT AND LIFE MEMBER D. S. BOYDEN DIES IN ST. PETERSBURG

It is with regret that Society members learn of the death of Davis Stuart Boyden, past president and Life Member of the ASHVE, who died in St. Petersburg, Fla., November 26, 1945, of a sudden heart attack.

Mr. Boyden was born December 28, 1872, at Walpole, Mass., where he attended the public schools. Following his graduation he specialized in the field of light, heat and power, and his entire business career dating from 1890 had been devoted to this work. He spent several years with the Suburban Gas and Electric Co., and 31 years with the Boston Edison Co., in charge of the street steam department. He retired from active business in 1937.

Davis S. Boyden

In the early days of radio, Mr. Boyden was a *"ham"* operator of extensive radio equipment which he operated early mornings and evenings, talking daily with many amateur operators in widely scattered locations in the country.

He was a Lieutenant-Colonel in the U. S. Army Signal Corps, and served as Personnel Officer for three years, and his arduous duties during the early part of World War II were a valuable contribution to the war effort, but his strenuous activities caused his retirement.

He joined the Society in 1909 and served on the Council in 1917 and again in 1930 and on many committees. He was chairman of the Guide Publication Committee in 1932 and served as Treasurer in 1933 and 1934, was elected Second Vice-President in 1935, First Vice-President in 1936, and served as President in 1937. He was a leader in the early days of the Massachusetts Chapter, serving on many of its committees. Although he retired from business in 1937, he maintained an active interest in Society work and served in an advisory capacity to the committees for the 51st Annual Meeting in Boston, January 1945.

Mr. Boyden was an Honorary Member, also a past president of the National District Heating Association and gave freely of his time and ability in the organization and in promoting its welfare.

Military services were conducted on Saturday, December 1, at the Short and Williamson Funeral Home, Allston, Mass., and interment was at the Terrace Hill Cemetery, South Walpole.

Mr. Boyden is survived by his widow and one son, to whom the Officers and Council extend their deepest sympathy for the loss they have sustained.

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### PAST PRESIDENT C. B. J. SNYDER DIES IN BABYLON, L. I.

Charles B. J. Snyder, 85 years old, a prominent New York architect and Past President of the ASHVE, and his son, Robert Snyder, 51, were found dead of accidental gas poisoning on November 14, 1945, in their home at 103 Araca Road, Babylon, L. I. Gas was escaping from the kitchen range oven, and it is believed that the Snyders had lighted the burners on retiring, to heat the rooms, but during the night the flame had been extinguished by a draft.

The elder Snyder was born on November 4, 1860, at Stillwater, N. Y. Following his graduation from Cooper Union, New York, he became associated with Wm. E. Bishop, architect, New York City. From 1891 to 1923 he was the architect and superintendent of school buildings for the Board of Education, City of New York.

Despite his years the elder Mr. Snyder had been active in his profession, going almost daily to his office at 110 West 40th St., New York. He was a fellow in the *American Institute of Architects.*

He became a member of the Society in 1895, serving as a member of its Board of Governors from 1900 to 1904, as Second Vice-President in 1905, as First Vice-President in 1906, and as President of the Society in 1907.

It was with regret that the Officers and Council learned of his death, and their sincere and heartfelt sympathy is extended to his son, Howard H. Snyder of Babylon, who survives.

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### H. J. LARSH DIES IN INDIANAPOLIS

Word has just been received of the passing of Herschell J. Larsh, owner of the Larsh Sheet Metal Works, on July 15, 1945, in Indianapolis. He was born in Indianapolis on March 16, 1897, and was graduated from Manual Training High School. After completing an advance technical course in heating and ventilating he became an instructor at the school.

He was superintendent of the Sink and Edwards Heating and Ventilating Shop from 1917 to 1933, when he formed the Larsh Sheet Metal Works, specializing in heating, ventilating and air conditioning installations.

Mr. Larsh supervised the installation of heating and ventilating of Scottish Rite Cathedral Building, the Indiana State Library Building, both in Indianapolis, and numerous installations of industrial supply and exhaust systems for the General Motors plant.

Mr. Larsh is survived by his widow, who resides at 3805 East 38th St., Indianapolis, to whom the Officers and Council of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS extend their sincere sympathy.

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### W. A. EVANS OF AEROFIN, DIES SUDDENLY IN CLEVELAND

Word of the sudden death on November 23, 1945, of William A. Evans, district manager, Aerofin Corp., Cleveland, came as a shock to his many friends and associates. Death resulted from a cerebral hemorrhage, attributed to grief over the sudden death of his daughter, Anna Jane, a Lieutenant in the Army Medical Corps, who was killed in an accident near Camp Lee, Va., on October 18th this year.

Mr. Evans, a native of Boston and a graduate of the Massachusetts Institute of Technology, was an engineer in New York City for many years before becoming manager of the Boston Office of the Griscom Russell Co. in 1912. In 1915 he joined the staff of the Whitlock Coil Pipe Co. as engineer and sales manager. In 1929 he became branch manager for Carrier Corp. and subsidiaries.

Mr. Evans was closely associated with the Northern Ohio Chapter and one of its most active members. He served as Treasurer of the Chapter in 1942, as its Vice-President in 1943, and a member of the Board of Governors in 1944. His association with the Society has covered a period of 23 years. He was also a member of the *Cleveland Engineering Society* and the *American Society of Refrigerating Engineers.*

Mr. Evans is survived by his wife, Mrs. Jane Kline Evans, and two sons, Arthur K. Evans, St. Louis, and William A. Evans, Jr., Claverack, N. Y., to whom the Officers and Council of the Society extend their sincerest sympathy. Burial was at Poughkeepsie, N. Y.

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## AMOS HARD PASSES AWAY SUDDENLY

It was a shock to learn of the sudden death on November 26, 1945, of Amos L. Hard, chief engineer, Thos. Emery's Sons, Inc., Cincinnati, Ohio.

Amos L. Hard

Mr. Hard was born at White Bear, Minn., on November 18, 1896, where he attended the White Bear High School. From 1915 to 1918 he studied electrical engineering at the Westinghouse Technical Night School, and spent two years at the Cincinnati University, taking the night course in heating, ventilating and air conditioning.

He was in business for himself from 1920 to 1923 as an electrical contractor under the name of Windom Electric Co., Windom, Minn., and in the latter part of 1923 he became field engineer for Westinghouse Electric and Mfg. Co. In 1926 he became field engineer for the Westinghouse Elevator Co., holding this position until 1931, when he first became associated with Thos. Emery's Sons, Inc., where he supervised elevator maintenance and electrical installations at Carew Tower. In 1935 he was appointed chief engineer, which position he held at the time of his death.

Mr. Hard joined the Society in 1938 and had taken an active interest in the affairs of the Cincinnati Chapter. He served as its President in 1942 and as a member of its Board of Governors in 1943.

Word of his death came as a shock to the Officers and Council of the Society, who extend their deepest sympathy to his widow who survives.

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## DEATH OF R. E. POEHNER

The Indiana Chapter of the Society announces with regret the death on November 2, 1945, of Robert E. Poehner. Mr. Poehner died suddenly at his home, 2308 Coyner Ave., Indianapolis, Ind., of a heart attack.

Mr. Poehner was born at Newport, Ky., July 9, 1878, where he received his early education. His family moved to Cincinnati some time later, and Mr. Poehner settled in Indianapolis 43 years ago. Most of this time he was associated with the W. H. Johnson Co., heating contractors, who several years ago gave up the contracting business and concentrated on the manufacture of radiator cabinets and covers.

In 1934 Mr. Poehner established his own business, and some of his more recent installations were the new office and research building for the Pitman Moore Biological Co. and the Rotary Convalescent Hospital at the Indiana University Medical Center, Indianapolis, Ind. Some of the other projects in Indiana which Mr. Poehner was in responsible charge of the installations are, Claypool Hotel, Riley Hospital Group Buildings and Power House, Methodist Hospital, Continental Bank Building, Illinois Office Building, Indiana University Gymnasium Building, etc.

Mr. Poehner joined the ASHVE in 1928 and was a charter member of the Indiana Chapter. He was also active in Rotary and Masonic Work, a member of Shrine and Scottish Rite, York Rite, Chapter 5, Indianapolis, the Indianapolis Council and Raper Commandery, and Royal Order of Jesters.

His untimely death was a shock to his many friends and associates in the heating, ventilating and contracting industry, and the Officers and Council of the Society extend their sincerest sympathy to his widow, Mrs. Anna V. Poehner, his mother, Mrs. Anna Poehner, Cincinnati, and three sisters and one brother.

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## DEATH OF F. W. ROBINSON ANNOUNCED

Frederic W. Robinson, Manager of Electrical Department and Director of Research, Hanovia Chemical and Manufacturing Co., Newark, N. J., passed away on August 17, 1945.

Mr. Robinson was born in Widnes, England, on December 28, 1887, where he attended the Secondary High School, and in 1908 and 1909 he received his B.Sc. and M.Sc. from the University of Liverpool. He also attended the Technische Hochschule, Karlsruhe, Germany, where he specialized in post graduate research.

He served as chairman of the committee on industry and commerce of the Newark Defense Council, secretary of the Alpine Press, both of Newark, and director of the Amersil Company of Hillside.

He was a member of the Essex Club of Newark, the Short Hills Club, the *Chemical Society of London,* the *American Chemical Society* and the *American Electrochemical Societies.* Mr. Robinson was a contributor to the *Science Journal.*

Mr. Robinson was well thought of and respected among his business associates, and will be greatly missed. Although his membership in the Society was short, it is felt that he would have been an asset to the Society, and the Officers and Council of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS extend their sincere sympathy to his three daughters, who survive.

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## ONTARIO CHAPTER REPORTS MEMBER KILLED IN ACTION

The Ontario Chapter announces the death last year of Flight Officer Edson G. Armour, Royal Canadian Air Force, who was killed in action after a mine laying trip. He went into service on June 24, 1940, and after serving on the Eastern Coast Operational Service he obtained the rank of Flight Lieutenant, but reverted to Flying Officer in order to go overseas in 1943. He was with the *Bluenose Squadron* and had almost completed his tour when the accident occurred.

He was born on January 4, 1917, at Brantford, Ontario, Canada, and was graduated from Brantford Collegiate in 1935. He then attended Carnegie Institute of Technology and before graduating he enlisted in the RCAF. While waiting to be called he became sales engineer for Armour's, plumbing, heating and electrical contractors. During this time he devoted his time to estimating heating and air conditioning equipment.

The Officers and Council of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS extend their heartfelt sympathy to Flight Officer Armour's mother, who lives at 55 Sheridan St., Brantford, Ontario, Canada.

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## DR. WINSLOW RECEIVES PRENTISS AWARD

At the Cleveland Health Museum's fifth annual luncheon at the Hotel Carter, Cleveland, Ohio, November 27, Dr. C.-E. A. Winslow, New Haven, Conn., professor emeritus of public health at Yale University, and President of ASHVE, was presented with the 1945 Elisabeth Severance Prentiss Award in health education. The award, established by the Museum last year, was made in recognition of Dr. Winslow's contribution to health education, and particularly for his development and use of the exhibit method of teaching now used by the Museum.

C.-E. A. Winslow

Dr. James R. Angell, president emeritus of Yale University, announced the award to the 600 persons attending the luncheon by radio from New York City. With Dr. Winslow at the presentation were Dr. Bruno F. Gebhard, director of the Museum, and Dr. W. W. Peter, Office of Inter-American Affairs.

The luncheon was sponsored by the women's committee of the Museum, headed by Mrs. Herman L. Vail, who had members of the Junior League serving as ushers. At the speakers' table with Dr. Winslow were Vernon H. Pribble, general manager of *WTAM*; Dr. Leon Newman, president of Cleveland Dental Society; Dr. Farrel T. Gallagher, president, Academy of Medicine; N. R. Howard, editor of The News; Dr. Lester Taylor, president, Cleveland Health Museum; Louis B. Seltzer, editor, Cleveland Press; Dr. William W. Greulich, director, Brush Foundation; Homer Calver, secretary, American Museum of Health, New York; Josephine D. Robertson, medical reporter of Cleveland Plain Dealer.

A national committee of seven outstanding medical men, headed by Dr. W. W. Bauer of the *American Medical Association*, selected Dr. Winslow as the winner of the award.

Dr. Winslow, a member of the ASHVE for over 13 years, served as curator of public health for the Museum of Natural History in New York from 1910 to 1922, and proved through his giant models of mosquitoes and flies that preventive medicine could be taught through the visible technique. He established the first department of health education in the New York State Department of Health.

He received his S.B. in 1898 and his M.S. in 1899 from Massachusetts Institute of Technology, and received an honorary degree of Doctor of Public Health in 1918 from New York University. He served as chairman of the New York Commission on Ventilation from 1913 to 1923, and in 1932 became Director of the John B. Pierce Laboratory of Hygiene.

## PRYKE ENTERS CONSULTING FIELD

Myers, Fuller and Addington, consulting engineers of 21 E. 40th St., New York 16, N. Y., announce that John K. M. Pryke has become associated with them. He has had considerable experience in radiant heating and will specialize in this as the need for a consultative service in this new field is well recognized.

He brings a well rounded experience in the fields of heating and air conditioning, and for many years prior to the War he was concerned with the design of radiant heating systems in England. During 1937, and again in 1939, he travelled extensively in the United States studying American methods of design and operation of mechanical equipment of buildings. With the evident interest which has developed in radiant heating in the United States, he foresees a wide field of application for this type of installation.

Mr. Pryke holds a B.Sc. (Engineering) degree from London University, and is an Associate Member of the *Institution of Civil Engineers* (London), the *Institution of Heating and Ventilating Engineers*, and the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

During the War Mr. Pryke held a commission in the British Army in the Corps of Royal Electrical and Mechanical Engineers. He was taken a prisoner on Crete in 1941, and spent three years in a German prison camp.

After his release he was assigned to the United States, serving with the British Army Staff in Washington, Detroit, and New York.

## COUNCIL RESOLUTION PRESENTED

A resolution adopted by the Council of the Society in honor of the late Commander Ferry C. Houghten, in the form of a leather bound book, was presented to Mrs. Mattie L. Houghten, his widow, at a dinner at the Raleigh Hotel, Washington, D. C., November 5, 1945. The presentation was made by Capt. Thomas H. Urdahl, USNR, a member of the Council and a friend of many years' standing of the Houghten family.

Capt. and Mrs. Robert L. Houghten, the son and daughter-in-law of Commander Houghten, were visiting in Washington at the time and were among those present. Other friends of Commander Houghten, formerly associated with him in both the Society and the Navy who were present were Lieut. Comdr. and Mrs. J. H. Van Alsburg and Lieut. Comdr. John Everetts, Jr.

The Washington Chapter of the ASHVE, of which Commander Houghten was a member, was represented by Pres. W. H. Littleford, Vice-Pres. L. Bert Nye, Mr. and Mrs. Leonard Holder, Miss Shirley Chambers, Mr. and Mrs. Fred Leser, and Mr. and Mrs. Albert S. Gates, Jr.

## SHEPARD JOINS DAVIDSON

John deB. Shepard is now associated in consulting engineering practice with P. L. Davidson, specializing in textile humidifying and air conditioning. Mr. Shepard is in charge of the Southern office at Greenville, S. C. Since 1934 he was air conditioning engineer of the Consolidated Gas Electric Light and Power Co., Baltimore, Md., and prior to that time he spent five years with Carrier Engineering Corp. at Newark, N. J., and Philadelphia, Pa.

## CUSHING NAMED VICE-PRES. PAYNE FURNACE CO.

The appointment of Charles F. Cushing, as vice-president and assistant general manager of Payne Furnace Co., Beverly Hills, Calif., effective November 1, was announced by Elroy Payne, president.

Mr. Cushing leaves the post of distribution manager of Bryant Heater Co., Cleveland, another member company of Dresser Industries, with whom he has been associated since 1935. Prior to joining Bryant, Mr. Cushing was connected with Frigidaire Corp., and Davison Chemical Corp. He is a graduate of Johns Hopkins University and joined the ASHVE in 1938.

## JOHNSON SERVICE CO. ELECTS VICE-PRES.

The election of Maxwell F. Rather, New York, as a vice-president of the Johnson Service Co., was recently announced by the Board of Directors. This is the first change for some time in the staff of Johnson officers, which has heretofore consisted of H. W. Ellis, chairman; J. A. Cutler, president and general manager; O. G. Ward, vice-president; Paul F. Johnson, treasurer; and R. J. Murphy, secretary and assistant treasurer.

Mr. Rather joined the Johnson Service Co. as a sales engineer in 1915, soon after being graduated from the University of Wisconsin's College of Engineering. After a few years in Texas and adjacent territory, he was branch manager at Cleveland for nearly 20 years, before being elevated in 1938 to manage the Eastern District, with headquarters in New York.

Mr. Rather joined the Society in 1919 and has maintained an active interest in its local and national affairs. He is also a member of the New York Athletic Club, and the New York Chamber of Commerce.

In his capacity as a vice-president, he will continue his work in New York as manager of the Eastern District and of the Export Division, constituting one of the three Johnson sales and installation districts.

## WHEELER ANNOUNCES EXPANSION

H. E. Wheeler, president of Air Comfort Corp., Chicago, Ill., announced the appointment of Roy Heier as merchandise sales manager, and C. O. Johnston as manager, Service Dept. In the sales department added staff members are: J. J. Smerz, E. R. Whitehead, and F. W. Berry. William Cade has been engaged as construction superintendent, relieving William Long, who will devote his entire time to sales engineering.

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## Bus Air Conditioning Compressor Driven by Main Engine

The first inter-city bus to operate an air conditioning system directly from its own main motor without using any auxiliary source of power recently underwent a trial run between Philadelphia and Syracuse. The bus, built by the A. C. Brill Co., Philadelphia, and air conditioned by the Carrier Corp., 302 S. Geddes St., Syracuse, N. Y., has cooling units and fans located in its forward end above the driver. A flow of conditioned air is discharged from a perforated duct over the heads of passengers. Alongside the driver are switches which permit him to turn on the refrigeration, after which the temperature is controlled by a thermostat. In winter, the outside air drawn into the conditioning system may be heated by hot water from the main engine.

To eliminate an extra motor, one big problem had to be overcome. With the compressor being powered directly from the main motor, the flow of liquid refrigerant to the cooling coil varied in volume with the speed of the motor. In other words, the compressor furnished too much cooling when the bus would speed along an extended, straight stretch of road; too little when the bus was crawling through heavy traffic.

Though newly designed, the compressor's speed is still governed by the speed of the main motor. However, the compressor is equipped with automatic capacity regulation which controls the compressor capacity independent of compressor speed. This device, coupled with an expansion valve to govern the flow of refrigerant liquid to the cooling coil, is said to assure proper temperature within the bus.

# NOMINATIONS FOR 1946

## Nominations for Officers and Council

The Nominating Committee appointed to select candidates for Officers of the Society for the coming year, 1946, submits the following list of nominees:

*For President:*
**Alfred J. Offner**, New York, N. Y.
*For First Vice-President:*
**B. M. Woods**, Berkeley, Calif.
*For Second Vice-President:*
**G. L. Tuve**, Cleveland, Ohio
*For Treasurer:*
**J. F. Collins, Jr.**, Pittsburgh, Pa.
*For Members of Council (Three-Year Term)*
**Earl G. Carrier**, Boston, Mass.
**F. W. Hutchinson**, Lafayette, Ind.
**R. A. Sherman**, Columbus, Ohio
**M. S. Wunderlich**, St. Paul, Minn.

Respectfully submitted,
NOMINATING COMMITTEE,
M. W. Bishop, *Chairman*

In accordance with the provisions of the Society's Constitution, By-Laws and Rules, ballots containing the names of the above candidates will be sent to the membership for voting upon prior to the Annual Meeting in January.

**Art. B-VIII**—*Section 11.* The Nominating Committee shall consist of one (1) member eligible to vote designated by each Chapter, or his alternate also appointed by the Chapter. The Secretary of each Chapter shall certify to the Secretary of the Society on or before January first the names of the member and alternate selected.

The Committee shall meet at the Annual Meeting of the Society at the call of the Secretary of the Society and shall effect its own organization and elect its own Chairman. At the Semi-Annual Meeting of the Society, if possible, the Nominating Committee shall select the nominees for the ensuing year for the offices of President, First Vice-President, Second Vice-President, Treasurer, and four (4) members of the Council. In any event the names of the nominees shall be certified to the Secretary of the Society before September twentieth, with the written consent of each nominee to fill the office for which he has been selected and their names with the offices to which they have been nominated shall be published in the October issue of the Journal.

**Art. B-IX**—*Section 1.* Twenty (20) or more members of the Society, eligible to vote, may present to the Secretary, over their signatures, the name of any member eligible to hold office in the Society as a candidate for any office, provided such name is presented at least sixty (60) days preceding the next Annual Meeting, together with the written consent of the nominee to fill the office for which he has been selected, and the Secretary shall add such names to the ballot if they are not already included in the list of names presented in the formal report of the Nominating Committee. Such names when presented shall be included on the printed ballot, with special notation that they are presented by members independent of the Nominating Committee report. . . .

**Art. B-IX**—*Section 2.* The Secretary shall prepare ballots with the names of all candidates and forward them to the members, eligible to vote, at least thirty (30) days before the date of the Annual Meeting.

## Nominations for Members of Committee on Research

Although committees of the Society are usually appointed, in view of the great importance of the Committee on Research and the financial responsibility it would be called upon to assume, it has been made more representative of the entire membership of the Society by a process of *election.* The election is governed by the By-Laws for the election of officers, with the single exception that Members of the Committee on Research are nominated by the Council instead of by a Nominating Committee.

In accordance with the Regulations for the Government of the Research Laboratory, the Council announces the nomination of the following members of the Committee for election to succeed those members whose present terms expire January, 1946.

*Three-Year Term*

**L. N. Hunter**, Johnstown, Pa.

**C. O. Mackey**, Ithaca, N. Y.

**R. D. Madison**, Buffalo, N. Y.

**L. G. Miller**, East Lansing, Mich.

**L. P. Saunders**, Lockport, N. Y.

The regulations governing the nomination and election of members of the Committee on Research are as follows:

### ARTICLE II—ORGANIZATION

*Section 1. Committee on Research*—There shall be a standing committee known as the Committee on Research, consisting of fifteen (15) members each serving for three (3) years and five (5) retiring each year. The outgoing Chairman if serving in that capacity during the last year of his three (3) year term on the Committee shall without election become an additional member of the Committee on Research for one (1) year.

(*a*) The Council shall nominate previous to July first of each year five (5) members to fill the vacancies of those retiring at the next Annual Meeting.

(*b*) The nominations made by the Council shall be published in the October issue of the Society's Journal.

(*c*) Any ten (10) members of the Society eligible to vote may present to the Secretary over their signatures, the name of one (1) or more additional nominees for the Committee on Research, provided such name or names are presented at least sixty (60) days prior to the next Annual Meeting, and such additional nominations shall be placed on the ballot opposite the nominations made by the Council.

(*d*) The election shall otherwise conform to the regulations provided for the election of officers of the Society in the Constitution, By-Laws and Rules.

(*e*) Vacancies may be filled by the Council, such persons chosen by the Council to serve until a successor is elected at the next Annual Meeting.

## Code for Instruction of Welding Operators

In 1939 the American Welding Society organized a committee on minimum requirements of instruction for welding operators to prepare suitable training standards for vocational courses in welding. As a result, in July 1942 Part A—Arc Welding of Steel 3/16 to 3/4 In. Thick, the first in a series, was issued as a tentative standard. With the publication of this revised edition it has been made a full standard and is known as the Code of Minimum Requirements for Instruction of Welding Operators—Part A—Arc Welding of Steel 3/16 to 3/4 In. Thick. It is the first of four basic courses and is divided into two principal sections.

The first section is a mandatory part and designates the minimum provisions and requirements which must be fulfilled by any welding course which is to be considered as complying with this code. This portion of the code which is applicable to carbon steels (0.31 per cent carbon max.), is subdivided into six sections covering such items as general definitions, equipment and facilities of the school, qualifications and duties of the instructor, instructions in welding practice, elementary instruction in welding theory, and final tests. The welding exercises included are designed to teach the student to make bead, fillet, and groove welds in the flat, horizontal, vertical, and overhead position.

The second portion of the code is non-mandatory and contains nine appendices intended to be of aid to the student as well as the school. Topics covered include design of positioning equipment, design and use of testing apparatus, welding electrodes, suggested exercises, and an annotated bibliography of publications relating to arc welding.

As stated in the foreword of this booklet, while the prescribed course is intended for use in training students to acquire sufficient skill to enable them to pass the minimum qualification tests for welding operators prescribed in the AWS Standard Qualification Procedure, it may also be used as a guide in the preparation of a course for training welding operators to a limited degree of skill for a particular job. Copies of this code may be obtained from the American Welding Society, 33 W. 39th St., New York 18, N. Y., for 50c. Special discount is provided for group quantities.

The booklet contains 83+ IV pp., 6x9 in., and is paper covered.

## Fuel Utilization

A British text, the Efficient Use of Fuel, which was prepared and edited by a large group of British technologists, has been reprinted for American sale and distribution. Though this book was prepared for use in England and the discussion of fuels, together with those portions which are devoted to a description of equipment, are given without reference to American practice, the bulk of principles covered will be of interest to readers in this country.

In general, the book is a fundamental text rather than a handbook and begins with a discussion of the origin, nature, properties, and uses of coal. Other fuels such as coke, coal gas, blast furnace and producer gas, water gas, fuel oils, and electricity are included. The fundamental principles of combustion and gasification, properties and utilization of steam, heat transmission, fluid flow, feedwater purification, boiler efficiency, and testing are incorporated in the text in such a manner as to be of value to the technical student. Others engaged in the utilization of fuel will be interested in this book, which also includes such subjects as stoker and boiler operation, pulverized fuel, steam boilers and auxiliary equipment, gas producers, furnaces, refractory and insulating materials, uses of steam for industrial purposes, hot water and steam heating, drying, thermostatic controls, oil and its utilization, and instruments.

As this text was prepared under the direction of the education subcommittee of the fuel efficiency committee of the British Ministry of Fuel and Power, much of the equipment illustrated and some of the practices recommended are peculiar to the British, so that a student in this country would do well to amplify his reading from other (and probably more condensed) texts used in American colleges.

The American edition of this text is published by the Chemical Publishing Co., Inc., 26 Court St., Dept. 44, Brooklyn 2, N. Y. There are 807 +viii pp., and the price is $8.50.

## Arc Welding

Lessons in Arc Welding is a revised and new printing of the second edition to assist both new and experienced welders as well as all persons interested or concerned with the subject.

The book includes 61 lessons in arc welding and has over 133 photos and illustrations to supplement the text. From the first paragraphs dealing with instructions to the operator to the 571 examination questions and answers given in the closing pages, the book sets forth the practical instruction based on the experiences of Arthur Madson, head instructor in the Lincoln arc welding school.

Published with the objective of aiding those interested in welding to use the process successfully and economically, this book explains the fundamentals of this method of joining metals by the fusion principle and incorporates some new information such as how to apply the latest types of electrodes and welding techniques developed during the war years.

The lessons begin with a discussion of the electric welding machine and associated equipment. Instructions and exercises follow which are designed to teach the student to make lap, butt, and fillet welds in the flat, overhead, and vertical positions. The use of both bare and shielded arc electrodes are included, and the use of various electrodes for welding aluminum alloys, chromium, nickel, and manganese steel alloys are stressed.

This $5\frac{1}{2}$x$8\frac{1}{2}$ in. book contains 176 pp., has a semi-flexible simulated leather, gold embossed cover, and is published by the Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio. The price postpaid in the United States is 50c per copy, elsewhere 75c.

# Candidates for Membership

The Constitution of the Society, as now amended, requires the following mode of procedure in voting on applicants for membership in the Society. All applications for membership are to be sent to the Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society or sent to the members in other approved manner as ordered by the Council. When replies are received from references, the Candidate's application shall be submitted to and acted upon by the Committee on Admission and Advancement as soon as possible.

When the Committee on Admission and Advancement has acted favorably upon a Candidate's application and assigned his grade, the Council shall vote upon the election of the proposed Candidate for membership by letter ballot. During the past month 61 applications for membership have been received and the names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Committee on Admission and Advancement, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by December 22, 1945, these candidates will be balloted upon by the Council. Those elected to membership will be notified by the Secretary immediately after election.

**Anderson, George A.**, Power & Htg. Engr., William Adams Engineers. **Proposers**: E. B. Ericsson, F. P. Keeney. **Seconders**: C. M. Burnam, Jr., C. E. Price.

**Angus, Donald L.**, Engr., H. H. Angus. **Proposers**: H. H. Angus, A. M. Clark. **Seconders**: H. R. Roth, William Philip.

**Arnold, Thomas L.**, Mgr., Vulcan Radiator Co. **Proposers**: E. R. Clement, E. J. Ritchie, **Seconders**: Winfield Roeder, A. J. Mongillo.

**Asbury, Edgar M.**, Sales Engr., Armstrong Cork Co. **Proposers**: A. M. Chase, Jr., R. F. Barnes. **Seconders**: D. M. Mills, G. J. Collins.

**Belsky, George A.**, Chief Engr., Majestic Refrigerator Corp. **Proposers**: J. A. Heller, C. S. Koehler. **Seconders**: H. S. Johnson, J. J. Corey.* (*Reinstatement & Advancement*)

**Bisbee, Bertin A.**, Partner, L. E. Smith Hardware Co. **Proposers**: W. E. Heibel, F. D. Lawrence. **Seconders**: S. W. Fletcher, J. F. Gschwind.

**Brown, Maurice W.**, Asst. Mgr., American Blower Corp. **Proposers**: J. A. Bishop, H. J. Martyn. **Seconders**: C. R. Gardner, B. S. Foss, Jr. (*Advancement*)

**Bruen, Robert**, Htg. Contr. & Owner. **Proposers**: N. H. Peterson, H. V. Hickman. **Seconders**: K. O. Alexander, D. I. Murphy.

**Caton, Ross R., Jr.**, Pres., Caton Supply Co. **Proposers**: M. B. Shea, R. H. McGeorge. **Seconders**: L. A. Burch, J. B. Wallace.

**Champagne, Alex**, Owner, O. Champagne & Fils. **Proposers**: Aylmer Hamlet, G. E. Perras. **Seconders**: J. H. Storey, Leo Garneau.

**Chewning, Ray C.**, Asst., J. Donald Kroeker. **Proposers**: J. D. Kroeker, B. W. Farnes. **Seconders**: W. B. Morrison, Frank Urban, Jr.

**Cole, Victor**, Engr., Carrier Corp. **Proposers**: W. H. Driscoll, Herbert Peacock. **Seconders**: O. W. Armspach, A. F. Beach, Jr.

**Collins, Edward E.**, Refrig. Engr., Retail Construction Co. **Proposers**: R. B. Holland, G. N. Eskra. **Seconders**: James Gayner, W. J. Archer.

**Culver, Frank C.**, Mfrs. Repr., Day & Night Manufacturing Co. **Proposers**: M. N. Musgrave, R. O. Wesley. **Seconders**: C. W. Finn, W. J. Widmer.

**Davies, Albert T.**, Assoc., C. Howard Crane. **Proposers**: J. R. Kell, H. W. J. Lipscombe. **Seconders**: W. W. Carruthers, C. H. Crane.

**Debes, Charles N.**, Owner, Charles N. Debes and Assoc. **Proposers**: Victor Lathers, G. L. Larson. **Seconders**: C. J. Braatz, D. W. Nelson.

**Donovan, Richard F.**, Exper. & Research Engr., General Appliance Engrg. Co. **Proposers**: W. J. McKinney, R. F. Hahn. **Seconders**: G. R. Bilderback, P. E. Seepe.

**English, Richard B.**, Ensign, U. S. Naval Reserve. **Proposers**: James Holt, A. L. Hesselschwerdt, Jr. **Seconders**: G. B. Wilkes, C. M. F. Peterson.

**Etter, Norman W. P.**, Htg. Engr., Enamel & Heating Products, Ltd. **Proposers**: F. R. Rand, A. G. Baxter. **Seconders**: F. R. Bishop, A. W. Moss.

**Feinberg, Emanuel**, Pres., American Thermal Industries, Inc. **Proposers**: R. S. M. Wilde, E. F. Hyde. **Seconders**: G. H. Tuttle, S. S. Sanford. (*Advancement*)

**Goodwin, Walter C.**, Negotiation Mgr., Westinghouse Electric. **Proposers**: W. S. Farnum, I. R. Cummings. **Seconders**: I. S. Ritter, Isadore Director.

**Graham, William A.**, Prod. Engr., Reid Hayden, Inc. **Proposers**: Karl Selden, Jr., James MacDonald. **Seconders**: R. E. Mason, A. Z. Price.

**Hanson, Roy W.**, Dist. Mgr., Bastian-Morley Co., Inc. **Proposers**: B. S. Foss, Jr., E. T. Gessell. **Seconders**: C. R. Gardner, R. E. Allison.

**Herkimer, Harold**, Engr., Raisler Corp. **Proposers**: F. F. Taverna, C. W. Trambauer. **Seconders**: R. K. Raisler, Herbert Herkimer.

**Hobson, William C., Jr.**, Designer-Estimator, U. S. Naval Repair Base. **Proposers**: C. B. Sadler, D. M. Keefer. **Seconders**: W. O. Roenicke*, J. D. Hiller*.

**Howard, Joseph R.**, Sales Engr., Minneapolis-Honeywell Regulator Co. **Proposers**: K. C. Woodward, S. R. Osborne. **Seconders**: R. W. Sidbury, P. D. Bemis.

**Kennedy, Arthur M.**, Plbg. & Htg. Designer, R. P. Allsop. **Proposers**: A. H. Hills, S. A. Jennings. **Seconders**: D. O. Price, A. Nearingburg.

**Kuck, Theodore A.**, Field Engr., South Side Hardware & Plumbing Co. **Proposers**: Ernest Szekely, B. M. Kluge. **Seconders**: J. R. Vernon, I. J. Haus.

**Lamont, James F.**, The M. S. Little Mfg. Co. **Proposers**: W. K. Simpson, P. D. Bemis. **Seconders**: J. R. Smak, L. A. Teasdale.

**Lang, George T.**, Engr., ASSA Ltda. S.A.I. **Proposers**: G. M. Lassalle,* Alberto Mattei.* **Seconders**: Armando Guetrat,* M. A. Ramsey.*

**Lopker, Frank J.**, Owner, Frank J. Lopker Co. **Proposers**: W. H. C. Ness, Leo Hungerford. **Seconders**: R. A. Lowe, A. G. O'Rear.

**Marsh, George R.**, Sales Engr., C. J. Merrill, Inc. **Proposers**: C. J. Merrill, C. R. Swaney. **Seconders**: K. E. Terry,* R. W. Crosby.*

**McCoy, Philip W.**, Asst. Chief Engr., Bryant Heater Co. **Proposers**: H. W. Heisterkamp, K. T. Davis. **Seconders**: L. C. Harvey, J. L. Frisse.

**Mehaffey, Robert V.**, Cons. Engr., Robert V. Mehaffey-Associated Engrs. **Proposers**: M. J. Bamond, E. N. McDonnell. **Seconders**: N. W. Swanson, J. E. McDonnell.

**Panar, David**, Engr., Air Vent Sheet Metal. **Proposers**: Sidney Becker, A. B. Madden. **Seconders**: Aylmer Hamlet, Leo Garneau.

**Potter, Ralph E.**, Mech. Engr., The Austin Co. **Proposers**: H. B. Matzen, E. T. Best. **Seconders**: R. W. Cumming, Ernest Graber.

**Pryke, John K. M.**, Cons. Engr., Myers, Fuller & Addington. **Proposers**: C. A. Fuller, L. L. Munier. **Seconders**: Richard Wolff, T. Napier Adlam. (*Advancement*)

**Repino, Philip A.**, Plant Engr., Lebanon Steel Foundry. **Proposers**: L. H. Pogalies, A. F. Manna. **Seconders**: T. E. Terry, F. J. Stanley.

**Reutlinger, Roland R., Sr.**, Vice-Pres. & Gen. Mgr., Combustioneer Corp. PROPOSERS: A. E. Beitzell, W. C. Jones. SECONDERS: W. H. Littleford, F. B. Sale.

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*Non-Member.

ROOSE, ROBERT W., Student, University of Illinois. PROPOSERS: S. Konzo, O. A. Leutwiler*. SECONDERS: John Henry*, A. P. Kratz.

RUNGE, NATHAN P., Sales Engr., Garden City Fan Co. PROPOSERS: C. H. Jackson, L. W. Hessler. SECONDERS: H. W. Schreiber, W. C. Kussmaul.*

SANDERS, GEORGE O., Branch Mgr., Penn Electric Switch Co. PROPOSERS: J. B. Wallace, J. F. McIntire. SECONDERS: R. F. Connell, R. K. Milward.

SCHIWETZ, DAVID P., Branch Mgr., York Corp. PROPOSERS: K. W. Selden, Jr., M. M. Crout. SECONDERS: R. L. Beach, E. S. deWitt.

SHIPP, WILLIAM H., Application Engr., Minneapolis-Honeywell Regulator Co. PROPOSERS: F. H. Brigham, Adolph Ehrenzeller. SECONDERS: John Bonner, L. B. Mann.

SIGNOR, CARL W., Engr., The Detroit Edison Co. PROPOSERS: C. F. Donohoe, G. D. Winans. SECONDERS: E. E. Dubry, E. T. Smith.

SILK, WILLIAM H., Htg. Engr., Cutting & Ciresi. PROPOSERS: G. B. Priester, R. H. Cutting. SECONDERS: J. W. James, J. L. Frisse.

SNOW, DAVID, Exec. Engr., Peerless of America, Inc. PROPOSERS: J. C. Matchett, C. W. DeLand. SECONDERS: C. W. Johnson, C. H. Bevington.

STINARD, RUTHERFORD L., Engr., The Trane Co. PROPOSERS: B. H. Lee, N. R. Miller. SECONDERS: A. F. Hinrichsen, A. F. Beach, Jr. (*Reinstatement & Advancement*)

TELLER, WILLIAM R., Dir. of Engrg. & Dvlpt., Bryant Heater Co. PROPOSERS: H. W. Heisterkamp, L. C. Harvey. SECONDERS: K. T. Davis, J. L. Frisse.

TOUCEY, RICHARD M., Treas.-Sales Engr., E. R. Clement, Inc. PROPOSERS: E. R. Clement, L. O. R. Clark. SECONDERS: C. W. Freeman, P. D. Bemis.

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# Candidates Elected

In the past issues of the Journal of the Society the names of the following men were listed as Candidates for Membership. The membership grade of each Candidate has been assigned by the Committee on Admission and Advancement and balloted upon by the Council. We are now instructed by the Council to post herewith, as required by Art. B-III, Sec. 8, of the By-Laws, the following list of candidates elected:

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GRISWOLD, ARTHUR S., Engr., The Detroit Edison Co., Detroit, Mich.

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JENKINS, CHESTER P., Asst. Chief Engr., La-Del Fan Co., New Philadelphia, Ohio.

PHILLIPS, LEONARD R., Sr. Engr., Anemostat Corporation of America, New York, N. Y.

PICKETT, C. A., Branch Mgr., Herman Nelson Corp., Chicago, Ill. (*Reinstatement*)

ROY, ERNEST W., Design Engr., Kegarise-Cronk Engineering Co., Knoxville, Tenn.

SPAAN, JOHN H., Jr., Mgr., J. M. O'Connor Co., Oklahoma City, Okla.

STROUSE, Bernard H., Cons. Engr., Atlantic City, N. J.

THEOBALD, ARTHUR, Chief Engr., Payne Furnace Co., Beverly Hills, Calif. (*Advancement*)

WASSERMAN, ARTHUR L., Secy.-Treas., Marsden and Wasserman, Inc., Hartford, Conn.

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DE ROO, WILLIAM C., Engr., Hart & Cooley Manufacturing Co., Holland, Mich. (*Reinstatement*)

GARVIN, JOSHUA L., Operations Engr., Army Air Field, Charleston, S. C.

GLOVER, RALPH P., Cons. Engr., Oak Park, Ill.

JOHNSON, C. KENNETH, Research Engr., Anemostat Corporation of America, Elmwood, Conn.

JOHNSON, PHILIP B., Chief Engr., Huffman, Inc., Columbus, Ohio.

JONES, JOE T., Applications Engr., Fulton Sylphon Co., Washington, D. C.

LEESE, MILTON L., Sales Engr., A-1 Industrial Equipment, Philadelphia, Pa.

MARVIN, PHILIP R., Dir. of Research & Dvlpt., Milwaukee Gas Specialty Co., Milwaukee, Wis.

McLAREN, FREDERIC S., Secy.-Treas., Air Conditioning Engineering Corp., Forth Worth, Texas. (*Reinstatement*)

MOYNAN, JOSEPH S., Engr., New Orleans Public Service Inc., New Orleans, La.

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**Oklahoma:** Organized, 1935. Headquarters, Oklahoma City, Okla. Meets, Second Monday. President, Earle W. Gray, Third & Harvey Sts., Oklahoma City. Secretary, G. T. Donceel, Oklahoma Natural Gas Co., Oklahoma City.

**Ontario:** Organized, 1922. Headquarters, Toronto, Ont. Meets, First Monday. President, J. P. Fitzsimons, 4 Mowat Ave., Toronto, Ont. Secretary, H. R. Roth, 57 Bloor St., W., Toronto, Ont.

**Oregon:** Organized, 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. President, F. F. Urban, 6726 S. W. Burlingame Ave., Portland. Secretary, E. R. Lokey, 1238 N. W. Glisan St., Portland 9.

**Pacific Northwest:** Organized 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday, President. D. C. Griffin, 717 Lloyd Bldg., Seattle 1. Secretary, C. W. Finn, 717 Lloyd Bldg., Seattle 1.

**Philadelphia:** Organized, 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. President, R. D. Touton, Ninth & Columbia Ave., Philadelphia. Secretary, F. H. Buzzard, 213 S. Broad St., Philadelphia 7.

**Pittsburgh:** Organized, 1919. Headquarters, Pittsburgh, Pa. Meets, Second Monday. President, L. S. Maehling, 778 Country Club Dr., Pittsburgh 16. Secretary, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

**Rocky Mountain:** Organized, 1944. Headquarters, Denver, Colo. Meets, First Wednesday. President, G. D. Maves, 1550 Glencoe St., Denver 7. Secretary, Fred Janssen, 1123 W. Third Ave., Denver 9.

**St. Louis:** Organized, 1918. Headquarters, St. Louis, Mo. Meets, First Tuesday. President, W. J. Oonk, 4548 Red Bud Ave., St. Louis 15. Secretary, W. A. Russell, 7918 Kingsbury Blvd., Clayton 5, Mo.

**South Texas:** Organized, 1938. Headquarters, Houston, Tex Meets, Third Friday. President, J. A. Walsh, P. O. Box 1773, Houston. Secretary, D. M. Mills, Gray & Crawford, Houston 8.

**Southern California:** Organized, 1930. Headquarters, Los Angeles, Calif. Meets, Second Wednesday. President, Maron Kennedy, 5051 Santa Fe Ave., Los Angeles 11. Secretary, R. A. Lowe, 3744 Potomac Ave., Los Angeles 16.

**Utah:** Organized, 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. President, H. G. Richardson, 1433 Harvard Ave., Salt Lake City. Secretary, E. V. Gritton, 2470 S. 15th East St., Salt Lake City.

**Washington, D. C.:** Organized, 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. President, W. H. Littleford, 616 New York Ave., N. W., Washington. Secretary, Lester Maurer, 1738-33 Place, S. E., Washington 20.

**Western Michigan:** Organized, 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. President, H. J. Metzger, 137 E. Water St., Kalamazoo. Secretary, H. W. Wolters, 820 Staples Ave., N. W., Kalamazoo 54.

**Western New York:** Organized, 1919, Headquarters, Buffalo, N. Y. Meets, Second Monday. President, F. A. Moesel, 31 Main St., Buffalo 3. Secretary, J. S. Meyer, 38 Crescent Ave., Buffalo 14.

**Wisconsin:** Organized, 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. President, O. A. Trostel, Route No. 2, Thiensville. Secretary, J. R. Vernon, 507 E. Michigan St., Milwaukee 2.

## MAIL FROM KOREA

*A member stationed at Seule, Korea, has written the Society as follows:*

Will you kindly correct my mailing address?

At present I am the engineer for the Army Administration Section of the Military Government here in Korea. About 25 per cent of my work is in the field of Heating and Ventilating and since many installations have been neglected and few replacements made for several years by the previous Japanese Government due to the war, I *am* experiencing difficulties.

We are using Korean mechanics who are very cooperative. However, the best heating and ventilating concern I have been able to find, to date, lacks many of the automatic machines, modern equipment, tools, and instruments found customarily in our better American engineering firms. I am amazed, nevertheless, at the Koreans' skill in the use of hand tools, many of which are crude according to American standards.

My greatest bugaboo is the lack of replacement parts (such as boiler sections), fittings, and specialties. We are rapidly becoming experts in Rube Goldberg contraptions and weird substitutions. By scrounging, midnight requisitions and cannibalization we have sometimes obtained the proverbial needle from the hay stack.

At present we are stymied in finding a front section of one boiler and the rear section of another, both of which are a Japanese (reasonable) facsimile of the product of one of our largest American boiler manufacturers. I am still concerned with designing a firebrick substitution of a front section using an old ashpit door, moth-eaten fire-doors and cleanout doors which one of my officers located on a scrounging trip, at which he seems most proficient. We are welding angle iron door frames. Since this isn't a wet-base boiler I am somewhat concerned about balancing the front sections as this is a fairly flashy boiler and a fast steamer.

I have gone over this matter with our Korean engineer-contractor. He takes out his Japanese boiler databook and I take out an American data-book. He turns to page "umpty" in his book and I turn to page "umpty-ump" in mine; the drawings are identical. This gives us a working basis. I take out my K & E slipstick, and he takes out his Japanese slide-rule. I point and make gestures and the Korean engineer vigorously nods his head, sidewise or up and down, and all the time the interpreter is talking gibberish to him and coming back at me with broken English, but soon the interpreter begins to build up high steam pressure, so before he blows his top I pull out a deck of cigarettes, and we just sit and smoke for a few minutes until the interpreter's pressure needle drops back to the pin again.

Now that I've presented the problems with which we are confronted I wish to ask you a Mr. Anthony 64 Yen question. Will you people at stateside give a fellow member of the Society out here in the land of fantastic contrasts of the new and the old, some assistance? I flew out here in something like 50 hours' flying time and was able to bring only 65 lb of gear, so most of my professional books and data were ditched at the last minute. After searching through the few book stores left unbombed in Tokyo, and a dozen little holes in the wall here in Seule containing a pitifully small number of old American books, I found a 1936 edition of The Guide with the previous Jap owner's chop (signature stamp) stamped on many pages. I need an American Radiator Ideal Fitter. Catalog and data on fittings, and specialties, a B and G Handbook, and data on automatic water feeders, of which they never seem to have heard in Korea, etc. Also pump data on sizes 1½ to 5.

I am sure my friends Joe Murphy of Taco, or Ed McDonnell of McDonnell and Miller Company will cooperate in getting data for me, if you need their assistance. If there is any help for the widow's son now is the chance to demonstrate.

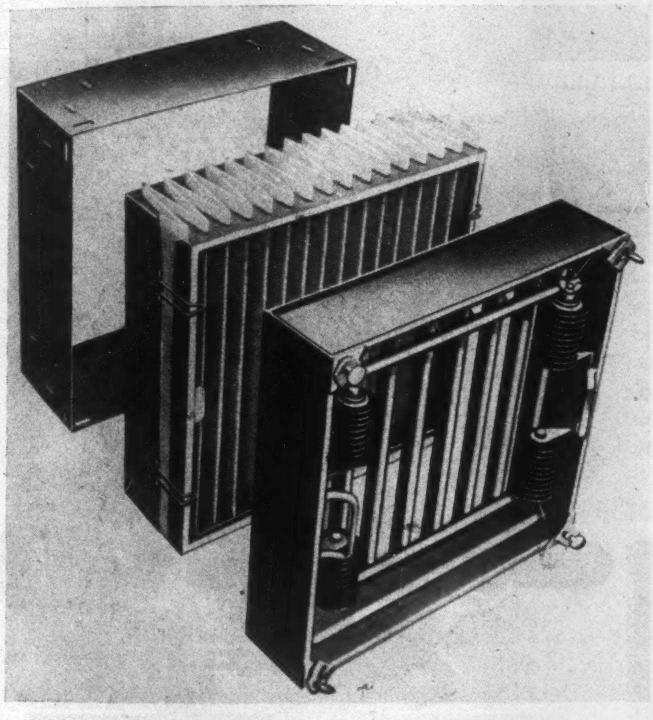
Cordially,  
ARTHUR W. NELSON,  
Major, CE Hdqrs. Military Government, USAFIK.

# EQUIPMENT DEVELOPMENTS

*For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1945 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.*

## Electrostatic Air Filter

No. 2947—The "Electro-Airmat," in which the collector element is electrostatically charged paper, introduces a new principle in electronic air filtration. The arrestance rating of the unit, when tested by the discoloration method, is said to be 90 per cent or better with atmospheric dust or smoke. This efficiency is obtained at the normal velocity of 35 fpm through the media and the standard rating of 1000 cfm per standard-sized 24x24 in. unit. The filter weighs 40 per cent less than electronic filters having metal plate collectors and requires 30 per cent less floor area, according to the manufacturer.



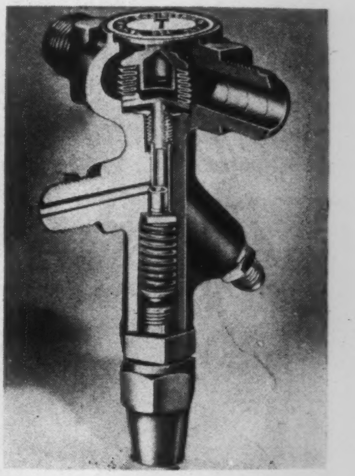
"Airmat" is a trade name for a cellulose product composed of a number of plies of porous, tissue-like sheets formed of short cellulose fibers in "jack-straw" arrangement. When an electrostatic charge is applied, the plies tend to separate and each individual fiber becomes a collecting electrode which attracts and holds the dust and smoke particles. It is also said to be an efficient mechanical filtering media; thus, when the power is off for any reason it affords protection against the infiltration of dust due to stack effects in air conditioning systems.

The power pack of the unit operates on a 110 volt, 60 cycle, single phase current. Total power consumption is approximately 220 watts at 110 volts, including transformer losses in the power pack, etc. When the collector paper has accumulated its dust load, it is removed and replaced with clean material by means of turning a crank in a mechanical loader which automatically folds the paper into the serrated base section of the filter unit. Spare cells can be provided for convenience in servicing. For small installations requiring only a few units, a manual loader answers the purpose.

Among the features claimed by the manufacturer, American Air Filter Co., Inc., 107 Central Ave., Louisville 8, Ky., are ease of installation, economy, convenience of maintenance, and reduction of electrical losses by the full height ionizers due to fewer wire ends.

## New Thermostatic Expansion Valve

No. 2948*—Shown here is a sectional view of the new "Model TS-1" thermostatic expansion valve which has recently been announced by Tenney Engineering Inc., 26 Avenue B, Newark 5, N. J. This valve is designed for standard commercial uses such as air conditioning, display cases, and refrigerator boxes and is said to be particularly adapted to modern evaporators with forced air, small tubes, short passes, and distributor header combinations.



It is also said to be particularly suitable for small evaporators or modern close coupled coil and machine combinations.

The liquid enters the valve at the lower right hand connection and the refrigerant is discharged to the evaporator through the lower left hand connection. The upper fittings are connected into the low side between coil outlet and compressor so that the bellows is in contact with suction gas, thus eliminating the use of a feeler bulb.

The manufacturer says that this valve incorporates such features as the elimination of any necessity for

[*Continued on page* 178]

Heating, Piping & Air Conditioning, [11-45]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

*(Circle each number in which you are interested)*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2947 | 2948 | 2949 | 2950 | 2951 | 2952 | 2953 | 2954 | 2955 | 2956 |
| 2957 | 2958 | 2959 | 2960 | | | | | | |
| 6013 | 6014 | 6015 | 6016 | 6017 | 6018 | 6019 | 6020 | 6021 | 6022 |
| 6023 | 6024 | 6025 | 6026 | 6027 | 6028 | 6029 | 6030 | 6031 | 6032 |
| 6033 | 6034 | 6035 | 6036 | 6037 | 6038 | 6039 | 6040 | 6041 | 6042 |

Name........................... Title...............

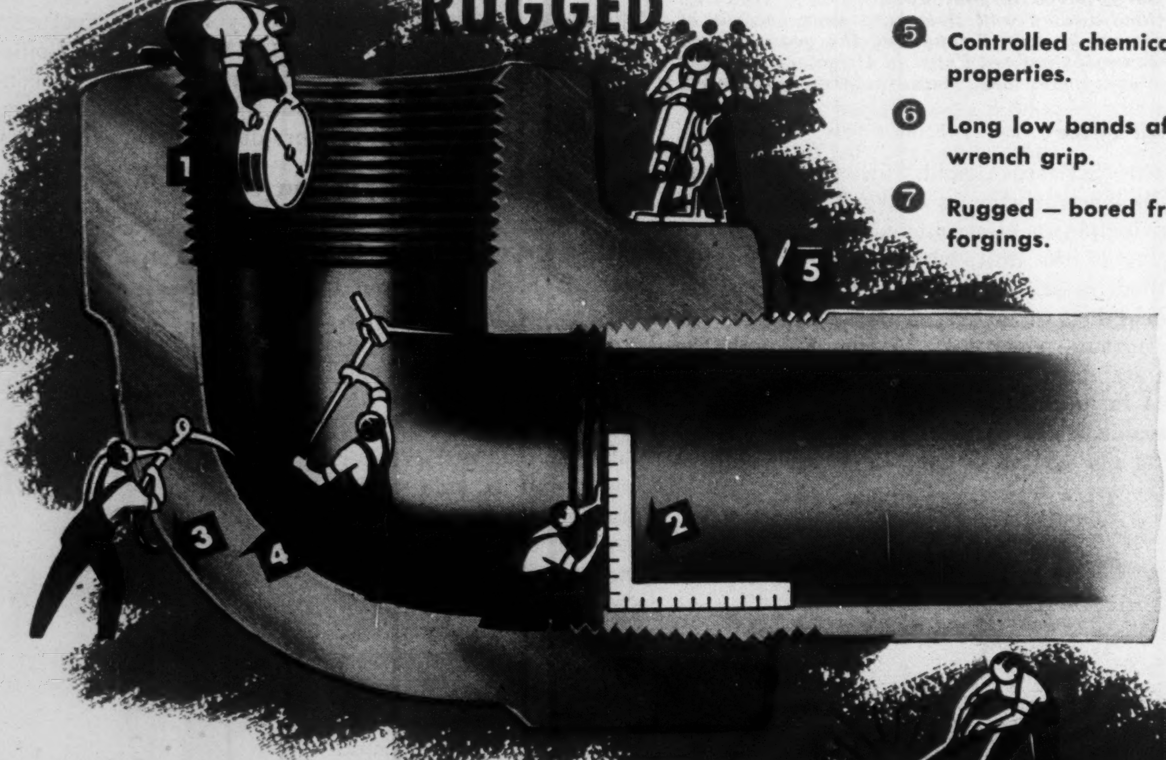
Company ..........................................

Address ..........................................

City............ Zone.............. State.........

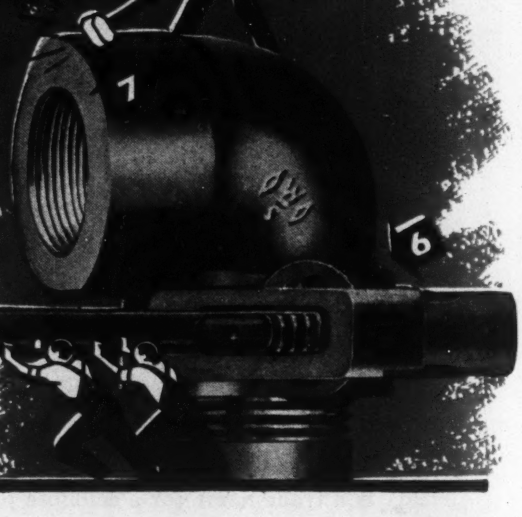
# ACCURATE... LEAK PROOF... RUGGED...

1. Threads are long, accurately cut.
2. Perfect alignment.
3. Uniform wall thickness.
4. Unrestricted flow.
5. Controlled chemical and physical properties.
6. Long low bands afford better wrench grip.
7. Rugged — bored from solid drop forgings.



● W-S Forged Steel Fittings are especially recommended for High Pressure, High Temperature Service in refineries, oil fields, chemical plants, shipyards, air conditioning and refrigeration plants, power plants and all hydraulic services.

Available in three classes—2000—3000—and 6000 pound. Sizes 1/4" to 4" I. P. S. Each class can be furnished in Carbon Steel; Carbon-Molybdenum Steel; Chromium-Molybdenum, Steel or Stainless Steel.



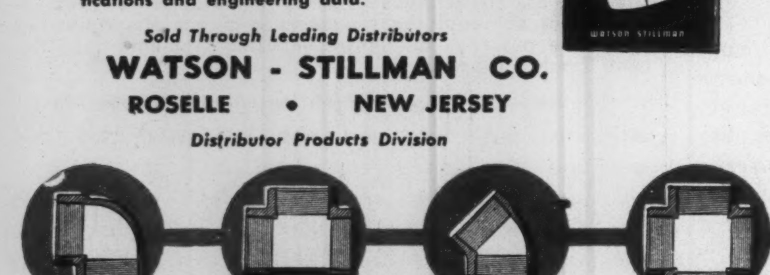
### THE COMPLETE STORY

**Bulletin A-3, Edition 12, gives the complete story of Watson-Stillman Forged Steel Screw End and Socket Welding Fittings. It includes details, specifications and engineering data.**

Forged
STEEL FITTINGS
WATSON STILLMAN

*Sold Through Leading Distributors*

**WATSON - STILLMAN CO.**
**ROSELLE • NEW JERSEY**
*Distributor Products Division*



WATSON-STILLMAN

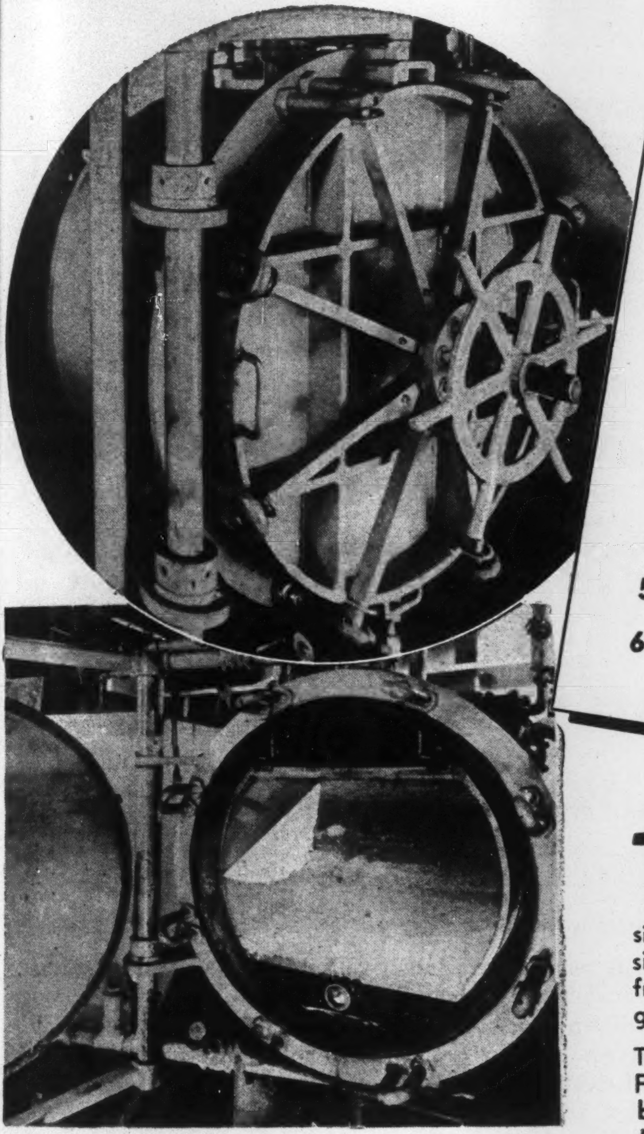
7871

# Removes ALL OIL from condensed returns used for boiler feed

## *The* REFINER

### A revolutionary new filter PROVEN IN SERVICE

1. Eliminates oil entering boilers. Improves boiler efficiency. Reduces boiler maintenance costs.
2. Saves heat units and fresh water by clarifying contaminated returns formerly dumped.
3. Removes free and EMULSIFIED oil from water to less than one-tenth part per million.
4. Requires no chemicals or wasteful back-washing.
5. Is simple, inexpensive to operate.
6. Requires little space.



*Upper picture shows the Refiner with special quick-locking door in place. Lower photo shows door open. Note how filter bed is peeled easily from pressure leaves in one piece.*

### APPLICATIONS

The REFINER can be used as a polishing filter for practically any liquid, including boiler feed water and condensate, alcoholic, malt and other beverages, chemicals, aromatics, paints, varnishes, lacquers, soaps, detergents, juices and liquid foods, and liquids used in processing other substances. The pressure-tight cylinder permits filtration of volatile, inflammable, and hazardous liquids. It also removes turbid matter of the same specific gravity as the liquid.

THE REFINER is an outstanding achievement in filters designed for extremely fine filtration. It breaks the tightest emulsion in condensate and removes both emulsified and free oil from an oil content as high as 90 parts per million down to a guaranteed maximum of one-tenth ppm.

The REFINER features compactness and low-cost operation. Flow rates of 20 to 200 gpm are obtained in single units. A battery of units provides greater capacities. The cost of filtered liquid by this new method of emulsion breaking is extremely low. No back-wash water is used.

The REFINER will greatly step up the efficiency of your plant and reduce boiler maintenance costs. Engineering assistance will be furnished gladly.

***WRITE FOR CATALOG***

**BLACKBURN-SMITH**
**MANUFACTURING COMPANY, INC.**
***For 60 years designers and manufacturers of filters.***
**82 River Street, Hoboken, N. J.**

---

Blackburn-Smith Mfg. Co. is a wholly owned subsidiary of Condenser Service & Engineering Co., Inc., builders of Evaporators, Stage Heaters, Gas Coolers, Drain Coolers and Heaters, Aftercoolers, Air Preheaters, Fuel Oil Heaters, Jacket Water Coolers, Process Heat Exchangers, Transformer Oil Coolers, Generator Air Coolers, Lubricating Oil Coolers, Storage Tank Oil Heaters, Feed Water Heaters, Distillers, Industrial and Oil Refinery Heat Exchangers, and other type of heat exchange equipment.

---

**Precision Threads Quickly Easily**

**with self-contained semi-automatic**

**RIDGID No. 65R**

Dies set to thread 1" to 2" pipe in 10 Seconds!
Workholder sets instantly!

● Save yourself time and effort in threading 1", 1¼", 1½" and 2" pipe. This rugged steel-and-malleable 65R gives you precision threads faster and with less effort than you've thought possible. You like the 10 second setting to size with one set of chasers that stay in the die stock (no extra dies to bother with) and the instant-setting foolproof workholder. Precision cut high-speed steel chasers and factory testing of every threader assure you of clean perfect threads, smooth faultless operation. For quicker easier threading buy the 65R at your Supply House.

**RIDGID**

**WORK-SAVER PIPE TOOLS**

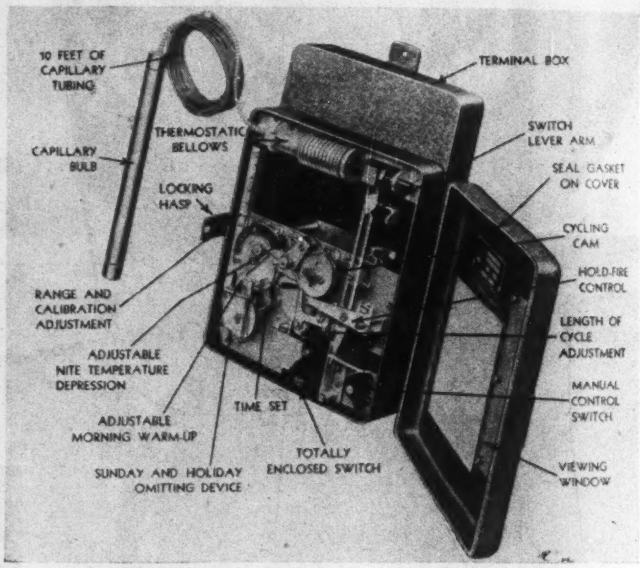
**THE RIDGE TOOL COMPANY · ELYRIA, OHIO, U. S. A.**

an external equalizer line, quick response to changes in suction vapor conditions thus providing close superheat control (such as 5 F superheat plus or minus ½ F for control) without "hunting," no sticking or binding as stem packing is not required, and positive valve closure above a definite evaporative pressure. It is also said that this design eliminates the need for any special charging to assure operation in a specific temperature range.

Other models for air conditioning and low temperature use are to be announced in the near future.

### Temperature Control System

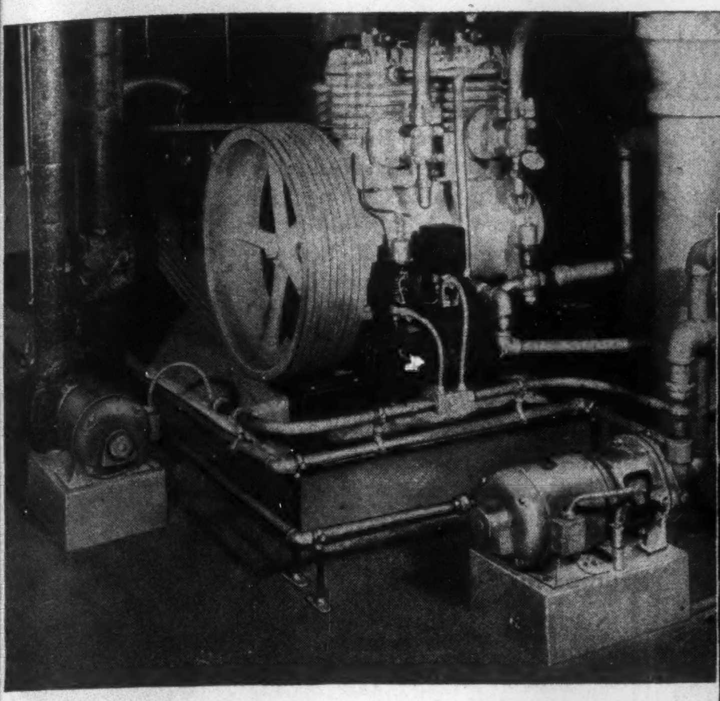
No. 2949—Operating on the principle that varying the "heat on" periods in accordance with outdoor temperature changes provides for greater economy and reduces over heating, the improved "Econostat" control system is offered by the Barber-Colman Co., 1228 Rock St., Rockford, Ill.


10 FEET OF CAPILLARY TUBING
CAPILLARY BULB
THERMOSTATIC BELLOWS
LOCKING HASP
RANGE AND CALIBRATION ADJUSTMENT
ADJUSTABLE NITE TEMPERATURE DEPRESSION
ADJUSTABLE MORNING WARM-UP
SUNDAY AND HOLIDAY OMITTING DEVICE
TIME SET
TOTALLY ENCLOSED SWITCH
TERMINAL BOX
SWITCH LEVER ARM
SEAL GASKET ON COVER
CYCLING CAM
HOLD-FIRE CONTROL
LENGTH OF CYCLE ADJUSTMENT
MANUAL CONTROL SWITCH
VIEWING WINDOW

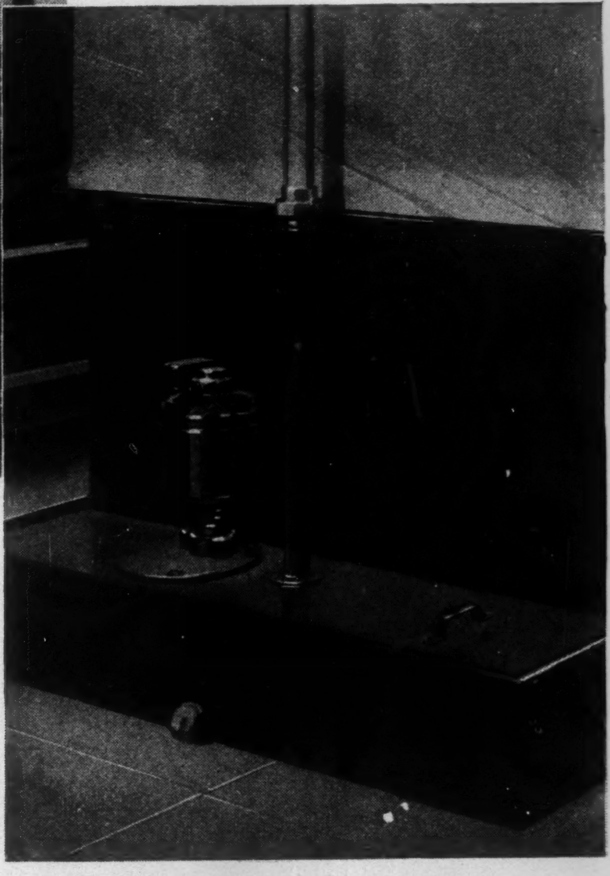
A temperature-sensitive bulb, located in the weather, is connected by capillary tubing to the control cabinet (shown here). Within the cabinet a synchronous motor drives a cycler mechanism which intermittently closes an electrical circuit to the heating system (motor-operated zone valve, stoker, oil or gas burner, or pump relay). The length of time the circuit is closed is governed by a bellows mechanism connected to the capillary tube and weather thermostat. The time for each cycle, operating range, the calibration, and the amount of night temperature depression, as well as the morning warm-up are all adjustable.

A feature, claimed by the manufacturer to be of great merit, is the use of a surface thermostat as a sensing device; it is installed on the piping and is electrically connected into the system so that the "heat on" period is not measured until the heat is actually at the radiators.

The manufacturer states that this control system is particularly adapted to multiple occupancy structures such as apartments, stores, office buildings, factories, hospitals, and churches. For these types of applications economy, reduction in overheating, and uniform temperatures are claimed.



Two horizontal 1-hp Motorpumps used in connection with an air conditioning system



A Model 1KRV submergence-type circulating Motorpump on an evaporative condenser

# MOTOR PUMP

## GIVES YOU DEPENDABLE HEAT-TRANSFER SERVICE

These compact, self-contained pumping units are designed and built to serve refrigeration equipment of all types—evaporative condensers, economizers, cooling towers, compressors—etc.

The Motorpump line ranges from 1/4 to 40 horsepower, with capacities up to 1800 gallons per minute. Models are available for immersion or sidewall type mounting.

Let our engineers or the nearest I-R distributor give you complete information. Where pumps are an integral part of complete equipment, specify and insist on Ingersoll-Rand Motorpumps.

INGERSOLL-RAND
CIRCULATING PUMP
69023

The Model KRVS Motorpump

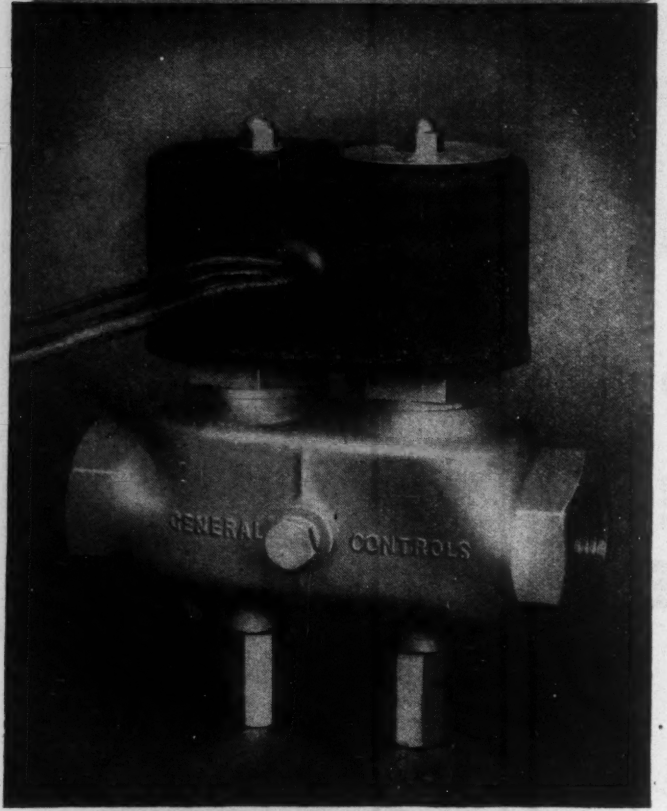
**Ingersoll-Rand**

CAMERON PUMP DIVISION
11 BROADWAY, NEW YORK 4, N. Y.

9-750

COMPRESSORS · AIR TOOLS · ROCK DRILLS
TURBO BLOWERS · CONDENSERS
CENTRIFUGAL PUMPS · OIL AND GAS ENGINES

SERIES D-40
HI-LOW-OFF
MAGNETIC GAS VALVE



D-40 is a current-failure 2-stage electro-magnetic gas valve used on many domestic and industrial applications where hi-low-off control is desired. Thermostatically controlled for constant temperature, low fire is adjustable to minimum flow of 8' per hour. Automatic thermopilots, limit controls, time clocks, etc., may be wired in series with this control, making it applicable to hot air furnaces, conversion burners, gas-fired boilers, etc. Solenoid coils are interchangeable.

OPERATION WITH
DUAL THERMOSTAT T-70-6 OR 7

Valve opens when energized, closes on current-failure, solenoid wires are color-identified, sequence of operation when used with dual thermostat: Assuming room temperature stands at 60° and thermostat is set at 70°, maximum gas flow is obtained. At 69° high-fire closes, leaving minimum gas flow which closes when 70° is reached. On down cycle, low-fire comes on first at 69° and if low-fire will not maintain heat loss, high-fire automatically comes on at approximately 67½°.

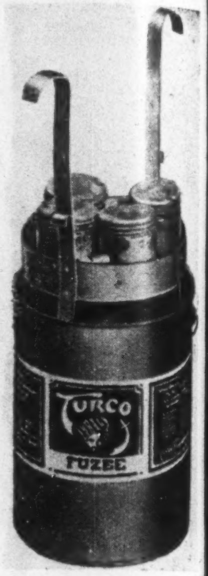
GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIF.

FACTORY BRANCHES: PHILADELPHIA • ATLANTA • BOSTON • CHICAGO • DALLAS
KANSAS CITY • NEW YORK • DENVER • DETROIT • CLEVELAND • PITTSBURGH
HOUSTON • SEATTLE • SAN FRANCISCO • DISTRIBUTORS IN PRINCIPAL CITIES

### Tank Cleaner Container

No. 2950—"Fuzee" cold tank cleaner compound is now available for unrestricted civilian use, according to the manufacturer, Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. The dip-tank container, here shown, is new. A metal dip rack has been developed to fit the standard 5 gal container, providing a means for cleaning small parts by immersion.

The compound is used in cold tank immersion cleaning of pistons, fuel pumps, carburetors, etc., from which—says the manufacturer—it quickly removes carbon, engine varnish, and other adhesive dirt.



### Pumps for Solvents

No. 2951—Flat belt and direct motor drive rotary pumps in capacities from 10 to 750 gpm at pressures to 100 psi have been adapted to filter and transfer applications in dry cleaning plants by the Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich. The pumps are designed to operate on the swinging vane principle and because of this action they are self-adjusting for wear, says the manufacturer.

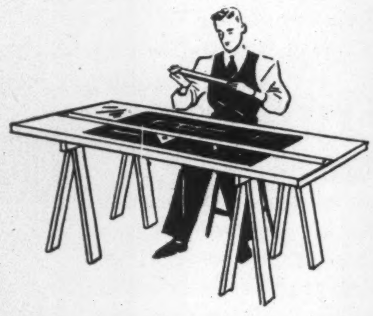
The swinging vanes move farther out of the recesses of the rotor as wear occurs at the tips.

### Air Circulators

No. 2952—Production of air circulators for industrial and home use has been stepped up to 50 units per hr and the plant has been put on a 12 month schedule, according to an announcement from the Fresh'nd-Aire Co., 325 N. Wells, Chicago 10, Ill. A "complete line for all requirements" is now in production, with models ranging from 14 to 35 in.

### Photocopy Machine

No. 2953—A 42 in. continuous printer for making photocopies has been announced by the American Photocopy Equipment Co., 2849 N. Clark St., Chicago, Ill. According to the manufacturer, the new model, "CP-421," makes actual size copies of anything written, printed, drawn, typed, or photographed. It is said to be ideal for making photographic tracings from large blueprints, since the machine will



"Always at your service"

WITH a background of more than 25 years practical experience in solving difficult refrigeration problems as they have arisen in the field — our engineering department is competent, ready and anxious to be of help to you on any refrigeration problem at any time. Write, wire, or phone.

Experienced Acme representatives in principal cities are glad to render personal help whenever possible. See your telephone book for his address.

**ACME PRODUCTS — Evaporative Condensers • Forced Convection Units • Ammonia Condensers • Pipe Coils • Freon Condensers • Dry-Ex Water Coolers • Oil Separators • Liquid Receivers • Flooded Water Coolers • Hi-Peak Water Coolers • Heat Exchangers**

***Write for Catalog on any item.***

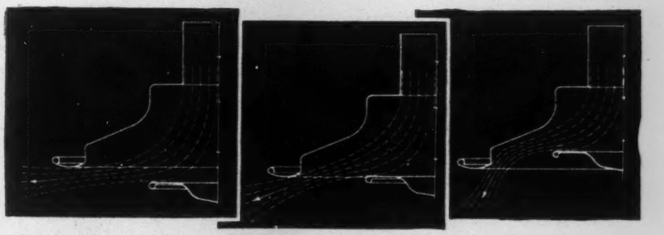
ACME PRODUCTS

**ACME INDUSTRIES**
**JACKSON · MICHIGAN**

## How *adjustable* air diffusers increase the efficiency of supply air diffusion.

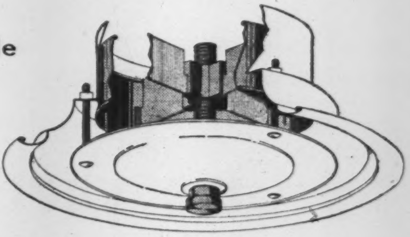
**Better mixing of room and supply air, more uniform temperatures throughout the occupied zone and noiseless, draftless air diffusion are accomplished with**

**KNO-DRAFT *adjustable* Diffusers**



**Any desired angle from vertical to horizontal at your fingertip.**

By simply turning the air adjustment screws (easily accessible from under the unit) the inner cone of any KNO-DRAFT Diffuser may be raised or lowered to secure any angle of air direction required by ceiling heights, system balancing, and individual or seasonal requirements. Thus the diffuser becomes more effective whether it is used in cooling, heating, ventilating, or combined systems, because it can expel chilled air parallel to the ceiling or eject heated air downward to prevent stratification.



**Type K** Adjustable Diffuser with Type D Volume Damper.

Pat. and pat. pending

**Any desired volume at your fingertip**

Every KNO-DRAFT Diffuser can be equipped with a built-in volume damper (easily adjusted by hand-turning knob under diffuser) which varies the outlet aperture uniformly without affecting the outlet velocity or diffusion pattern.

Thus KNO-DRAFT Diffusers can be adjusted quickly and accurately to the angle and volume needed to meet a wide variety of conditions, and as a result, the factors of temperature variation, temperature fluctuation, drafts and noise can be minimized considerably.

The W. B. Connor Engineering Corp. maintains a staff of specialists and district representatives in leading cities to assist you with any air distribution problem.

**FREE HANDBOOK**

Contains clear sketches, charts, dimension prints and instructive text that simplify the selection and installation of air diffusers.

For your copy write Dept. D-10

**W. B. CONNOR ENGINEERING CORP.**
*Air Diffusion* *Air Purification* *Air Recovery*
**114 E. 32nd Street** **New York 16, N. Y.**

handle photocopy paper up to 42 in. in width and any length.

In operation the original, together with a piece of photocopy paper, is placed on the moving belt which takes it through the machine, exposes it, and deposits it ready for processing on a tray at the top of the machine. Proper exposure is provided by varying the speed of the moving belt and by adjusting the shutter opening.

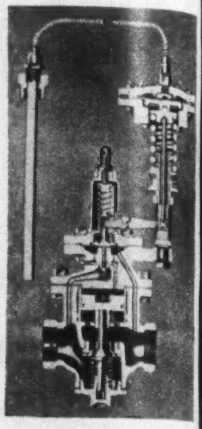
### Vacuum Process Pump

No. 2954—The "HandiVac," a vacuum process pump for use where 1 to 4 cfm is sufficient, has been announced by the Whittington Pump & Engineering Co., 245 S. Meridian St., Indianapolis 4, Ind. It is recommended by the manufacturer for laboratory use up to 1 in. of barometer, and is said to develop 28 in. Hg quickly and 15 in. almost instantly.

No cooling water is required for short periods of operation, and for continuous operation over long periods 6 gph is sufficient, says the manufacturer. Provision is made for connection and overflow.

### Temperature Regulator

No. 2955—A self-contained, spring loaded, internal pilot, piston operated temperature regulator for steam service has been announced by the Leslie Co., 51 Delafield Ave., Lyndhurst, N. J.



A feature of this new regulator is "Duo-Matic" control whereby, says the manufacturer, both accurate temperature regulation and pressure control are obtained simultaneously with a single regulator. Piping is thus simplified and installation costs are reduced, it is said.

The regulator has a thermostatic element with 100 F adjustable temperature range. It is single seated for positive dead end control. It is equipped with metal diaphragms and has no bellows or packing glands. All wearing parts are renewable, and interchangeability is said to allow complete overhaul without removal from the pipe line.

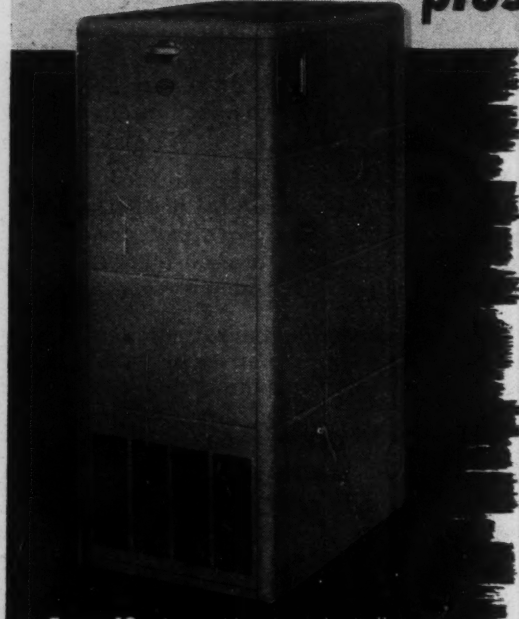
### Special Length Boiler Tubing

No. 2956—Boiler tubing, fabricated from standard length tube stock by the use of oxyacetylene pressure

Give your gas-heating customers the "*plus values*" they expect today

. . . with the new Type 10 Climatrol Gas Boiler

This new Series gives you the "something more" — *above* prewar standards — that makes a convincing sales story. It's restyled for better appearance, redesigned for better performance — with many new features you can promote. Among these is a new, exceptionally quiet burner. Further details in "Gas Boiler Facts and Figures Bulletin No. F-320," sent on request. . . . For creditable results and satisfied customers, concentrate on Climatrol installations. The Climatrol line is nationally known, nationally advertised, backed by an 88-year-old company with a reputation for progress in gas heating. Write for bulletin. . . . *L. J. Mueller Furnace Co., 2007 W. Oklahoma Ave., Milwaukee 7, Wisconsin.*



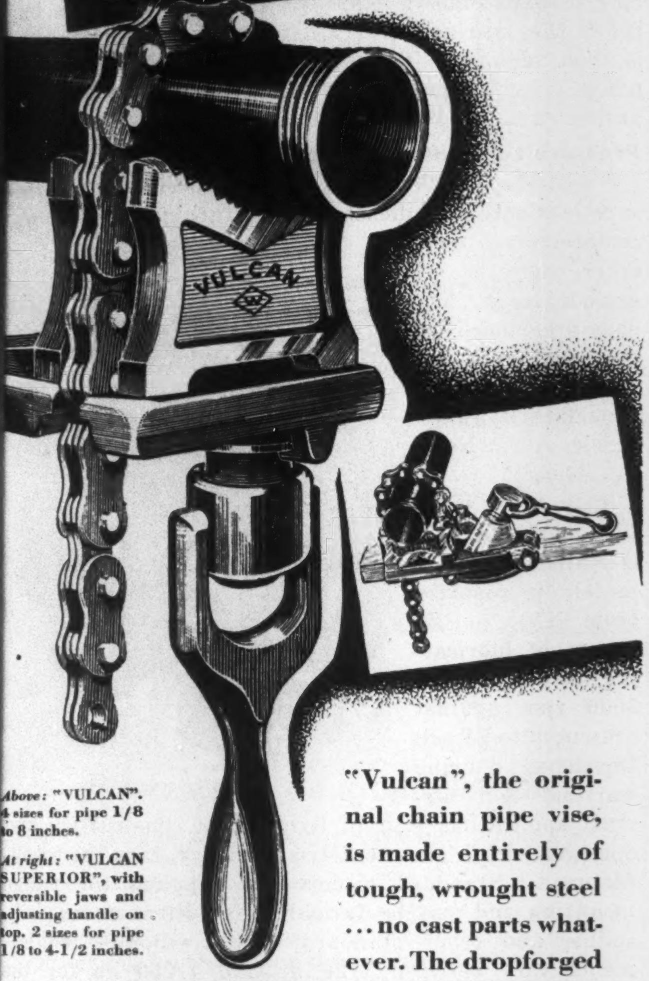
**Type 10,** for residences and smaller commercial jobs, has all controls and the backdraft diverter completely enclosed.

**Type 11,** (not illustrated) has the diverter enclosed within the jacket, with controls exposed.

Climatrol
Reg. U. S. Pat. Off.
GAS BOILERS

E-20

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"VULCAN"
Drop-forged
CHAIN PIPE VISES

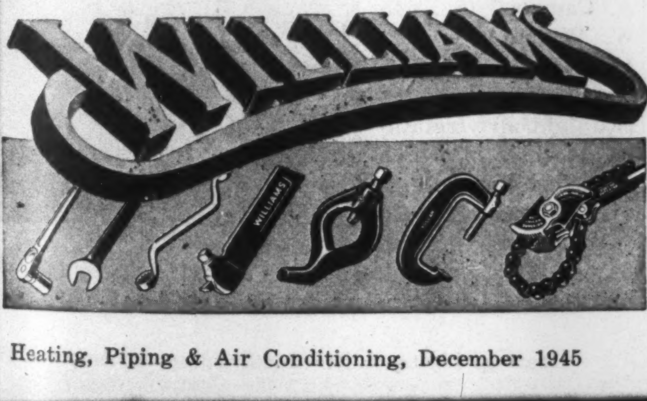


*Above:* "VULCAN". 4 sizes for pipe 1/8 to 8 inches.

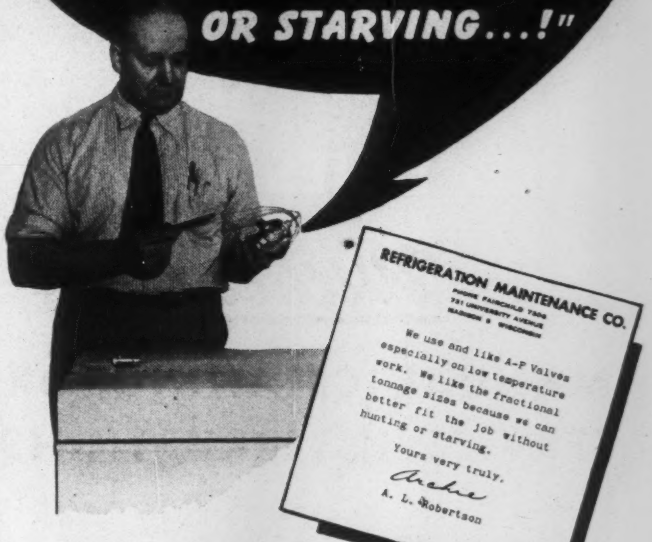
*At right:* "VULCAN SUPERIOR", with reversible jaws and adjusting handle on top. 2 sizes for pipe 1/8 to 4-1/2 inches.

**"Vulcan", the original chain pipe vise, is made entirely of tough, wrought steel ... no cast parts whatever. The dropforged jaws are of saw-tempered steel for file sharpening ... chains are of the same high quality as Williams' "Vulcan" Tongs. Fully guaranteed, and sold by Industrial, Plumbing and Oil Field Distributors everywhere.**

**J. H. WILLIAMS & CO., BUFFALO 7, N. Y.**



"FRACTIONAL TONNAGE AP VALVES FIT LOW TEMPERATURE WORK WITHOUT HUNTING OR STARVING...!"



REFRIGERATION MAINTENANCE CO.
PHONE FAIRCHILD 7306
731 UNIVERSITY AVENUE
MADISON 5 WISCONSIN

We use and like A-P Valves especially on low temperature work. We like the fractional tonnage sizes because we can better fit the job without hunting or starving.

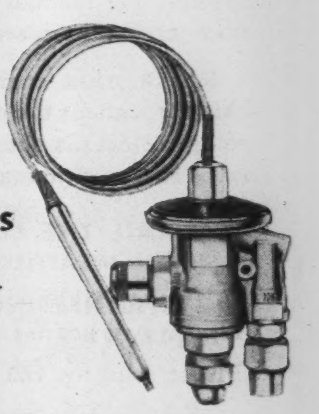
Yours very truly,
Archie
A. L. Robertson

**EXPERIENCED REFRIGERATION SERVICE**

Engineers like Mr. A. L. Robertson, of the Refrigeration Maintenance Co., Madison, Wis., give full credit to "A-P Dependable" Refrigerant Valves for their special adaptation to low temperature work. They find that "A-P" fractional tonnage sizes for Freon or Methyl Chloride refrigerant applications make it easier, as Mr. Robertson states, to fit the job without necessity of "hunting" or "starving" the line.

The underlying reason for the wide range of adaptability of A-P Refrigerant Valves is directly traceable to A-P testing practices. For every valve leaving the A-P factory has been tested again and again, and then precision-regulated to do its work without need for field adjusting. That means a lot to every practical refrigeration service engineer!

*Write* for Illustrated Bulletins covering A-P Refrigerant Valves



A-P Model 205 Thermostater Expansion Valve. Capacity up to 1 ton Freon.

**AUTOMATIC PRODUCTS COMPANY**
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Export Dept., 13 E. 40th St.
New York 16, N. Y.

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DEPENDABLE
*Refrigerant Valves*

Stocked and Sold by Good Refrigeration Jobbers Everywhere—
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KEEP
STEAM TRAPS
AND LINES CLEAN

*Without*

MANUAL CLEANING OR
SERVICE INTERRUPTIONS

**Clean systems give extra efficiency NOW... when it's more important than ever**

- Heating efficiency goes down—fuel costs go up when sludge, oil, grease, light lime and boiler carryover are allowed to accumulate in any heating system.

The RID-SLUDGE method cleans traps and removes the sludge in pipe lines, radiators and all other parts of the steam distribution system. No manual cleaning involved—and no interruption in service.

RID-SLUDGE engineering service is available throughout the country. Why not get the complete details about this money, time and labor-saving cleaning method.

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ENGINEERING DIVISION
Dept. H-12, 228 NORTH LA SALLE ST. • CHICAGO 1, ILLINOIS

Please send me the complete RID-SLUDGE Story.

NAME ..............................................
COMPANY ..............................................
ADDRESS ..............................................
CITY ............... ZONE ........ STATE ...........

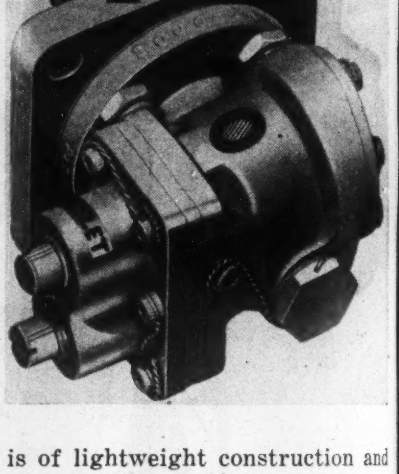
welding, is being made to any desired length, says the manufacturer, the Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y. The process has been used not only to weld short lengths of tubing to 20 ft lengths, but also to join standard lengths. In this manner continuous tubing 90 ft in length has been produced, it is said.

In welding with this process, squarely cut surfaces are butted together under pressure. While the pressure is maintained the joint is heated by means of a ring of oxyacetylene flames to a high temperature but below the melting point of steel. Increased pressure is then applied to the work by means of a hydraulic pump and continued until upsetting of the joint occurs, producing a weld of high quality.

### Pressure Lubrication Pump

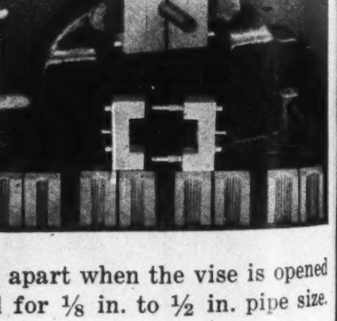
No. 2957—The "Series 400" pump, designed for pressure lubrication of diesel engines, turbines, generators, compressors, and other high speed machinery has been announced by the McIntyre Co., (formerly Zenith Associates) 15 Riverdale Ave., Newton, Mass.

This pump is of the gear type and is available in eight models to displace from 1¼ to 20 quarts of lubricating oil per hour at 3000 rpm against pressures to 75 psi. Developed during wartime for aircraft application, it is of lightweight construction and operates with high volumetric efficiency, says the manufacturer. Standard models are supplied for flange mounting and may be furnished for direct motor, belt, spline, and other standard drives. Power requirements vary between 1/20 hp and 1/250 hp for the largest and smallest capacity pumps.

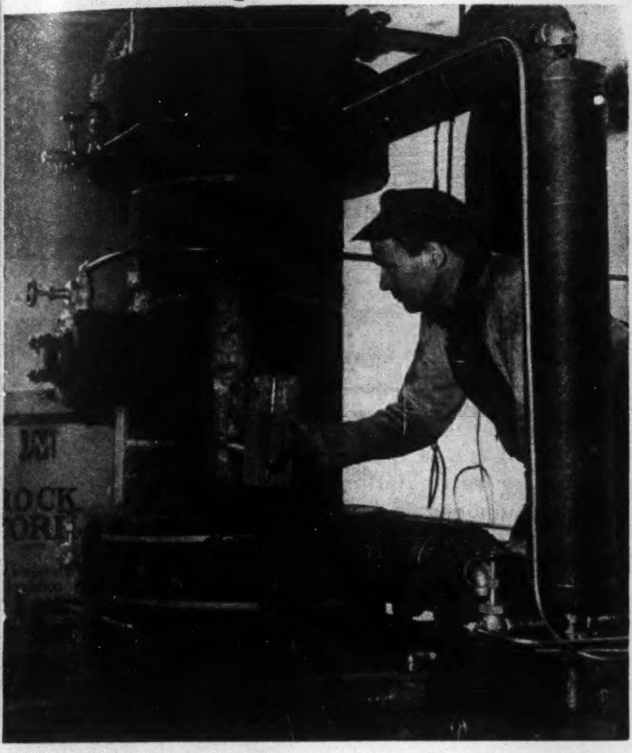


### Small Pipe Clamp

No. 2958**—A pipe gripping device known as "Nip-Grip" has been designed to hold small pipe in any vise without crushing or marring the surface or threads—so says the manufacturer, J. A. Campbell Co., 645 W. Wardlow Rd., Long Beach 7, Calif. The unit consists of two light alloy retainer blocks in which hardened steel inserts are slipped to hold various pipe sizes. Springs spread the blocks apart when the vise is opened and inserts are furnished for ⅛ in. to ½ in. pipe size.



# Tricks of the trade



## It's the *Knack* of the skilled mechanic that makes the difference in an insulation job.

THERE is an art to applying insulations properly—and only experienced applicators know the many little practices that make for success.

Johns-Manville places a trained force of workmen and engineers at your call—men capable of handling your insulation job from planning through application. In some areas, the organization is J-M's own construction force—in others, it's a J-M Technical Service Unit.

Because of its many advantages, J-M Rock Cork is preferred for low-temperature insulation by leading refrigeration engineers. Among the outstanding features of this basically mineral insulation are its low thermal conductivity, resistance to moisture and ease of installation.

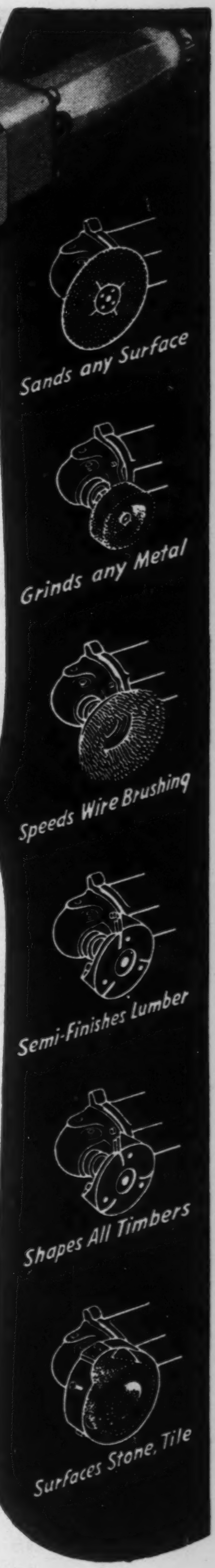
For details about Rock Cork, write for brochure DS-555. Johns-Manville, 22 East 40th St., New York 16, N. Y.

**And . . . remember an insulation's performance is only as good as its application.**

JM JOHNS-MANVILLE
**ROCK CORK**

---

**7" Heavy-Duty Sander $65**
7" Junior . . . . . . $39.50
7" Standard . . $53
9" Heavy-Duty . $78



# This One POWER TOOL Does All . .

A Black & Decker Portable Electric Sander drives many attachments . . . does many fabrication and installation jobs . . . on all types of heating, piping and air conditioning work. Available attachments include:

**WIRE CUP BRUSHES** for removing rust, old paint, scale, light weld spatter, oxidation, grease or tar.

**ABRASIVE DISCS** in 19 different grains, for sanding and smoothing any surface.

**GRINDING WHEELS** for smoothing welds and castings, surfacing concrete, stone or tile.

**ROTARY PLANER HEADS** for shaping and semi-finishing lumber—jobs formerly done with jack plane and adz.

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ADSCO
HEAT EXCHANGE
EQUIPMENT
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For many years Adsco has built a standard line of Heat Exchangers for certain water heating and condensate cooling requirements.

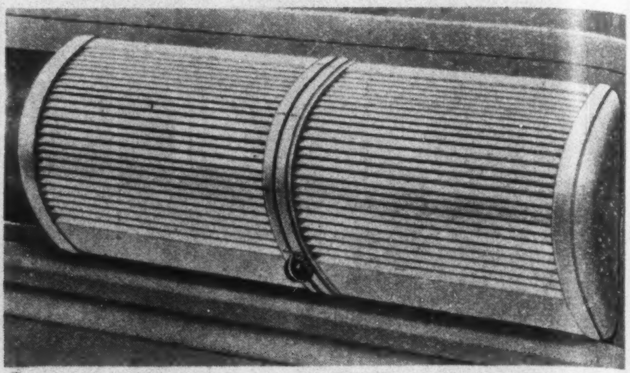
But since the application of tubular heat exchangers is so broad much equipment must be designed and built to fit certain space requirements and definite operating needs. As designers and builders of heat exchangers for a wide range of uses, Adsco has the engineering skill to analyze your problem, design and build the equipment to meet your exact requirements.

Write us about your heat exchanger problems or request Bulletin No. 35-75 HP.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA NEW YORK
Makers of "UP-TO-DATE" Steam Line Equipment For Over 65 Years

### Window Power Ventilator

No. 2959*—Styling for consumer acceptance along with product engineering are the features of a new window power ventilator unit designed for the United States Air Conditioning Corp., 2101 Kennedy St., N. E., Minneapolis 13, Minn., by Charles Davies and Associates, 50 E. 43rd St., New York 17, N. Y., the manufacturer reports.



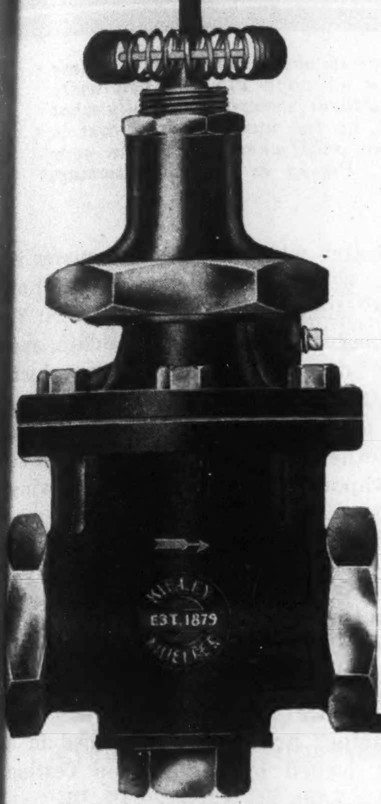
The unit has only one knob that controls all its functions, which are as follows: outdoor air inlet of filtered air; partial recirculation; complete recirculation; exhaust; volume regulation; and the on and off switch.

### Tool for Installing Control Tubing

No. 2960*—A new portable tool, consisting primarily of a vacuum hose and rotary saw, has been developed by the Minneapolis-Honeywell Regulator Co., 2701 Fourth Ave., South, Minneapolis 8, Minn. The saw contains tungsten carbide teeth and is used for cutting channels in plaster walls. Designed to simplify the installation of personalized heating controls in existing apartment buildings, the machine cuts a groove in a plaster wall just wide enough to hold the pneumatic copper tubing which connects the thermostat and control valve. After installation the channel is sealed with plastic cement tinted the color of the wall.

Operating on either a-c or d-c current at standard voltages, the machine is said to be capable of cutting through the hardest plaster or concrete at speeds up to 10 fpm. The depth of channel may be determined by the adjustment of a guide on the unit, and a cover on the cutting edge is used to prevent dust from flying into the air. This cover is connected to a vacuum cleaner which draws all dust into a water-filled container.

The manufacturer states that the machine, which requires no special training and may be readily used by the employees of the contractor installing the heating and control system, makes possible modernization of apartment heating systems without the costly and time consuming redecoration which has heretofore been necessary on all such jobs.



EXTREMELY ACCURATE REGULATION

. . . EXTREMELY COMPACT IN SIZE

A fraction turn of the handwheel—and you can control *exactly* the pressure of steam passing through this very compact K & M Reducing Valve. Model 481 is widely used for difficult reduction service in industrial processes—and as a primary valve in double reduction installations. Self-contained . . . made in bronze . . . available in valve sizes of 1/2″ to 2″—with 5 3/8″ the maximum overall measurement, face to face! Yet it accurately controls inlet pressures up to 250 lbs. . . . maintaining constant reduced pressures of 2 lbs. to 80% of the inlet. If you have a tough pressure reduction problem, perhaps K & M #481 is the answer. Our Engineering Department invites your inquiries.

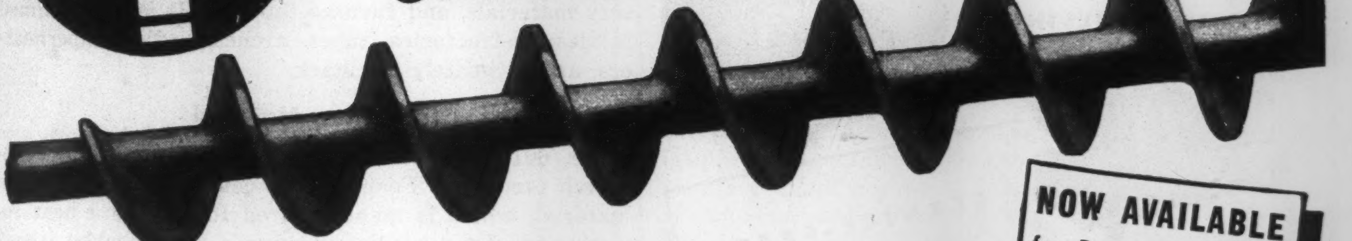
*Write for Catalog 66-C*

**KIELEY & MUELLER, INC.**
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS
**2015 43rd ST., NORTH BERGEN, N. J.**

*Awarded our employees for outstanding production achievement.*

For STOKERS

The CROWN Unbreakable Coal Feed Screw



NOW AVAILABLE for Prompt Delivery

WELDED All-Steel Worm—All Sizes—All Pitches

★ Crown's complete line of all-steel Coal Feed Screws meets every replacement and production requirement. Produced for both domestic and industrial stokers. Crown Screws are available with right or left hand screws, in all sizes and pitches, tapered or straight, and in combinations of pitches. Uniformly smooth surfaces insure that coal will flow freely and easily through the flights. Because it is all-steel with continuous weld, the Crown Coal Feed Screw guarantees long, continuous operation with full customer satisfaction. Crown is in a position to make prompt delivery on all sizes.

*In ordering give complete specifications on size and design.*

**CROWN IRON WORKS COMPANY**
**1202 Tyler St., N. E.** *Since 1878* **Minneapolis, Minn.**

KNOWN and USED THE WORLD AROUND

ALDRICH HEAT-PAK PRODUCTS

Aldrich Oil Burners and Burner-Boiler Units were standard equipment in United States Insular Bases the world around. That's proof of unmatched efficiency, performance . . . All during the war, Aldrich Co. worked night and day at their regular job—producing extra-value burners and burner-boiler units . . . Post war improvements are facts—not promises—in Aldrich equipment.

**HEAT-PAK Burners Models AX and BX**

Embodying famous Aldrich features, HEAT-PAK Model AX (.75 to 4.00 G. P. H.) and Model BX (3.00 to 8.00 G. P. H.) are being produced as fast as materials become available . . . Production of famous HEAT-PAK Burner-Boiler Units and oil-fired Water Heaters is limited only by manpower and materials.

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COMPANY
WYOMING, ILLINOIS

SERVICE-FREE

Aldrich engineering genius, designing skill, and production experience combine to give you equipment that is practically service free. No wonder Aldrich led the industry in prewar volume! Look to Aldrich for leadership in oil-fired equipment.

## RECENT TRADE LITERATURE

*For your convenience in obtaining copies of these bulletins, see coupon on page 175. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.*

### Air Exhausters

No. 6013—The "Agitair" wind actuated exhauster is described in a new 12 p., 8½x11 in. bulletin (EX-101) of Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y. The bulletin includes dimensions, performance data, and selection charts for the three types of exhausters which —the manufacturer states—may be used for general ventilation and exhausting service, marine applications, and for flue caps and other heavy duty service such as exhausting corrosive vapors. The unit has no moving parts and is said to prevent downdrafts, to be weatherproof and light tight, and to be effective at low wind velocities.

### Air Velocity and Temperature Indicating Instruments

No. 6014—"Alnor" pyrometers, special portable pyrometers, electrical resistance thermometers, and the direct reading "Velometer" are briefly described in a 4 p. pamphlet (2892) issued by the Illinois Testing Laboratories, 420 N. La Salle St., Chicago 10, Ill.

### Boiler Flue Cleaning Compound

No. 6015—An oxygen releasing compound, "Allenite," which is sprayed into the combustion chamber of boilers for the purpose of burning out soot, the carbon binder of fire scale, and for removing slag is described in a 6 p. pamphlet issued by the Robert G. Allen Co., 15 Moore St., New York 4, N. Y. The compound has been used extensively in marine boilers during the war and is said to be harmless to flues, boiler tubes, refractory materials, and furnace linings. It is also claimed to clean refractories, tubes, arches, baffles, superheaters, and ultimately the stack.

### Cellular Glass Insulation Material

No. 6016—One of the glass industry's wartime research products, "Foamglas," a cellular glass insulation material, which is manufactured for use as a heat resisting insulation, is described in a 24 p. booklet issued by the Pittsburgh Corning Corp., 632 Duquesne Way, Pittsburgh 22, Pa. A description of how the product is made, physical properties, available sizes of blocks, and installation data for use on tanks and towers are included.

### Condenser Tube Protectors

No. 6017—A new four-page, illustrated bulletin descibing the John Crane condenser tube protectors has been issued by the Crane Packing Co., 1872 Cuyler Ave., Chicago 13, Ill. Designed to provide protection against thinning and erosion at the inlet ends of the tubes, the protectors are made of a plastic material and are said to be highly resistant to abrasion.

★

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One of our clients, a prominent air diffusion equipment manufacturer, now has several territories available for representation that offer exceptional opportunities to establish a permanent and profitable business . . .

Write today for full details — all correspondence will be held in strict confidence.

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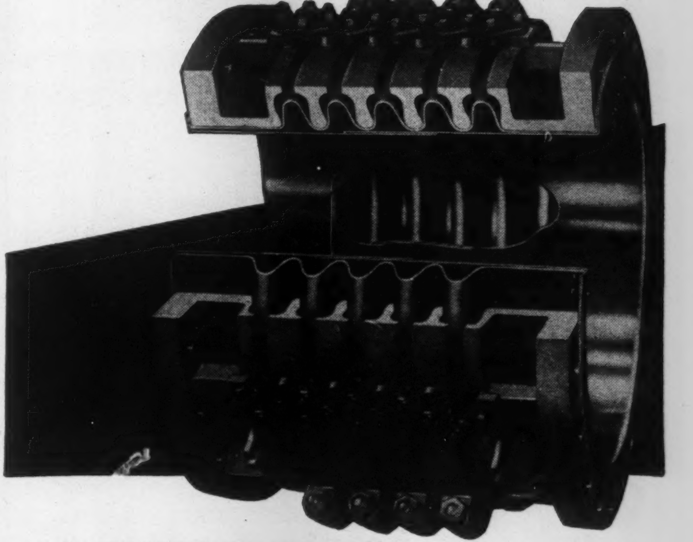
**CHICAGO 11, ILLINOIS**

# positively controlled corrugation movement



## with ZALLEA Improved Duo-Equalizing* Expansion Joints

In any corrugated expansion joint no two corrugations are ever identical. Wall thickness varies slightly within the limits of mill tolerances for the particular metal, making some points heavier or lighter than others and thereby affecting the amount of flexing or displacement. In order that all corrugations shall flex equally they must have identical wall thickness and temper throughout the entire shape, *or they must be positively controlled.* Temper can be controlled through proper furnace annealing but wall thickness is only uniform within the limits of mill tolerances.

In Zallea Improved Duo-Equalizing Expansion Joints movement of the corrugations during both expansion and contraction is positively controlled by the equalizing rings. Rings are linked together by pantograph chains so that each one (and the corrugation it controls) must move equally and simultaneously with all others. Thus, irrespective of slight differences between corrugations it is impossible for one to move more or less than any other, resulting in an expansion joint that will endure under the severest service conditions.

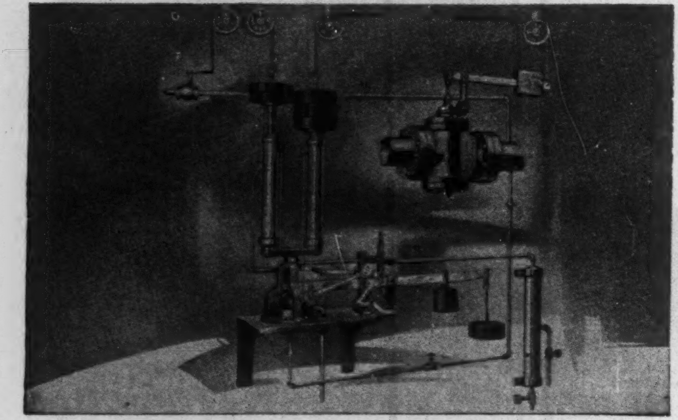
For complete description and specifications of this unique and improved expansion joint write for Bulletin 45, or ask us to quote on your requirements.

*U. S. Pat. Pending

*Made of copper, stainless steels and other corrosion-resistant alloys . . . traverse up to 7½" . . . for pressures from vacuum to 300 psi . . . for temperatures from sub-zero to 1600° F.*

"Code-Craft"...
**ZALLEA BROTHERS & JOHNSON**
EQUIPMENT FOR THE PROCESS INDUSTRIES
816 LOCUST ST. • WILMINGTON 99, DEL.

**your pressure problem**
**may be reduced**
**to nil . . .**
**with . . .**



**LOCKE #12**
**double motor combination regulator**

Whatever variation may now exist in initial pressure or volume required in any system carrying steam, gas, air, water, oil or other free-flowing liquids, a Locke Combination Pressure Regulator will maintain an even reduced pressure. Highest initial pressure can be reduced in a single step to any low or reduced pressure desired.

Locke #12 Double Motor Combination Regulator has one heavier weighted piston and valve, and lighter weights on a corresponding valve and piston. Its operation is smooth, certain, and accurate. As pressure increases, a pilot valve admits water to the cylinder manifold, forcing the lighter weighted piston to the top of its stroke, colsing the lighter weighted valve. If pressure continues to increase, the heavier weighted piston also moves upward, closing the heavier-weighted valve, the scale beam moving downward, cutting off pressure to cylinder manifold; decrease of pressure operates in reverse and as the heavier weighted piston moves downward, it opens the exhaust steam valve.

Locke variable compensator, attached to both cylinders, assures smooth and perfect operation.

*Please write us regarding your specific pressure regulation problems.*

DIVISION OF THE H. T. WILSON MACHINE CO., INC.

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**COMPANY**
WALTER AND OSBORNE STREETS
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HYDRAULIC REGULATORS • DAMPER REGULATORS • FAN ENGINE REGULATORS • BACK PRESSURE VALVES • BALANCED VALVES • ELECTRIC VALVES • REDUCING CONTROLS • FLOAT CONTROLS • PILOT CONTROLS • PUMP GOVERNORS • VACUUM BREAKERS • ENGINE STOPS • MASTER REGULATORS • OIL CONTROL VALVES • SOLENOID CONTROLS

### Cooling Towers

No. 6018—Mechnical draft water cooling towers having the distribution system and cooling surfaces of wood construction and utilizing wood, steel, masonry, or "Transite" casings are described and illustrated in a 19 p. catalog (145) issued by the C. H. Wheeler Mfg. Co., 19th, Leigh and Sedgley Ave., Philadelphia 32, Pa. The induced draft system using adjustable pitch propeller fans is featured, and some of the manufacturer's reasons for recommending this system are stated. Also included is a brief discussion of the fundamentals of evaporative cooling.

### Corrosion-Resistant Masonry

No. 6019—The use of solid masonry or masonry lined steel for corrosion-resistant construction is the subject of a new 51 p. booklet (810) offered by the U. S. Stoneware Co., Akron 9, Ohio. In addition to a description (including properties and shapes) of the company's line of acid-proof brick and tile, corrosion-resistant cements, and putty and caulking compound, construction notes are included, covering such items as mixing procedure, setting time, and various precautions to be observed.

### Differential Vacuum Heating

No. 6020—A 24 p. bulletin (633) issued by the C. A. Dunham Co., 450 E. Ohio St., Chicago 11, Ill., stresses the importance of a good heating system and accurate temperature control in hospitals. The fundamental principles of heating by steam under partial vacuum, together with a description of the manufacturer's differential vacuum system, are briefly set forth. To indicate that this type of heating system is economical and has been in use for some time, installations in hospitals, institutions, offices, and other large buildings are cited, and data on steam and fuel consumption are given.

### Heating and Air Conditioning Equipment

No. 6021—Installations in a school, a test room, a hospital, and a factory are briefly described to illustrate some of the applications of heating and air conditioning equipment offered by the Trane Co., La Crosse, Wis., in the October issue of Weather Magic. Also included is an article on where to use bucket traps.

### Heating System Cleaning Compound

No. 6022—A cleaning compound designed to remove existing scale, oil sludge, and rust from steam piping systems together with the pressure jet unit for introducing the liquid compound into the system mains beyond the boiler are described in a 4 p. pamphlet (form M-PJ 110 9/45 10M) and in a 6 p. pamphlet (form PJ 107, 5M 7-45) issued by Pressure-Jet Systems, Inc., 161 Wisconsin Ave., Milwaukee 3, Wis.

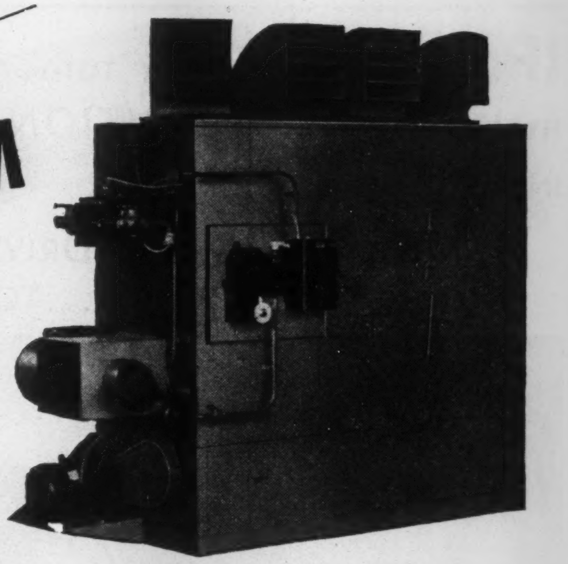
### Heating System Cleaning Service

No. 6023—The part "Rid-Sludge" service plays in removing light lime, oil, grease, algae, oxides, and boiler carryover from steam distribution systems is described in a 68 p. booklet called The Three Steps which has been issued by Apex All Weather Products, Engineering Div., Builders Bldg., Chicago 1, Ill. "Ryd-Al" service, which is virtually the same but also provides for cleaning the boiler, is briefly discussed together with

# *It's New!*

# THE AIRTHERM SPACE HEATER

## Provides More Efficient . . . More Economical Heat



THE new Airtherm Space Heater provides an even distribution of heat to all parts of the building through high velocity nozzles — is installed with a minimum of installation costs and requires practically no maintenance.

The new Airtherm Space Heater is available in 3 models — for floor mounting (as illustrated) or horizontal or vertical suspension. Choice of gas or oil burners on all models. Capacities from 650,000 to 1,950,000 BTU's per hour.

✓ Write for bulletin describing this new, efficient, money-saving heater, in detail.

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**MANUFACTURING COMPANY**
**711 S. Spring Avenue • St. Louis 10, Missouri**

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# 3-WAY GUARANTEE OF DEPENDABLE PERFORMANCE

## Hydrovac

### Super Vacuum Return Units

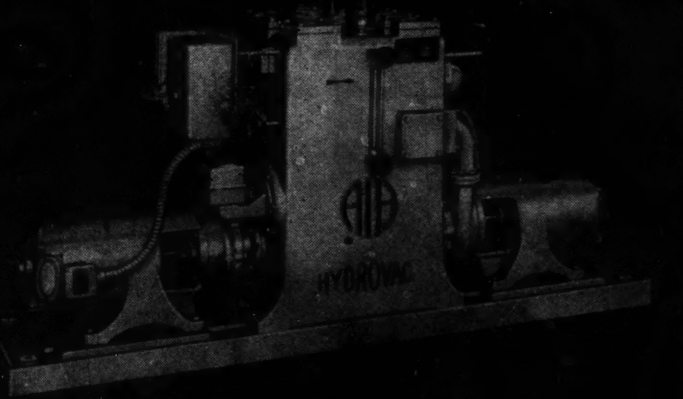
Not one, not two, but three guarantees highlight the quality and performance of Hydrovac units.

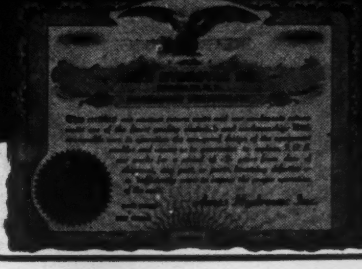
1. 3-year wear-proof guarantee.
2. Guarantee of a minimum of 25 inches of vacuum at 70° F. against a sealed inlet.
3. Guarantee that vacuum will not recede to zero, with unit at rest, in any time under 5 hours.

Note these features of Hydrovac's exceptional design and construction:

(1) Permoy Cast Iron Receiver; (2) Bronze Internal Parts; (3) Extra Large Shielded Bearings; (4) No Vacuum at Stuffing Box; (5) All facings machined; (6) Stainless Steel Rods; (7) Dash Pot Mechanical Valves; (8) Stainless Steel Bushings; (9) Wide Clearance Between Working Parts.

***Get All the Facts Back of Hydrovac's Triple Guarantee. Write for the 4-page Bulletin 100-B.***



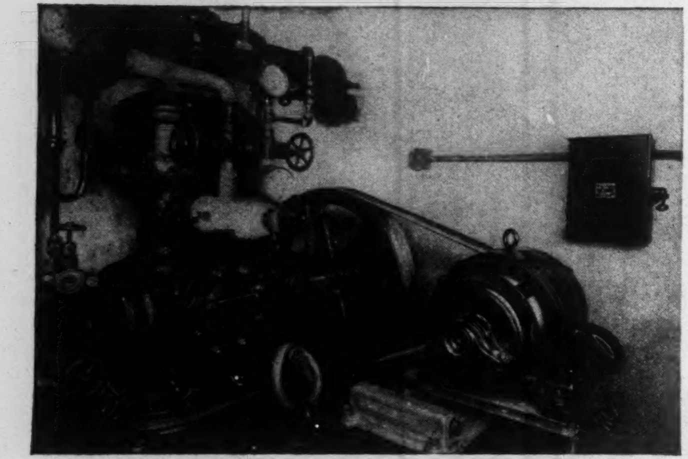


**AMES HYDROVAC INC.**
**290 SCHOLES STREET BROOKLYN 6, N. Y.**

**IF . . . your plans for tomorrow include *AIR CONDITIONING***

**INVESTIGATE . . .**

**TANNATE-ROCKWOOD DRIVES . . . TODAY**



Since the heart of an air-conditioning system is the power plant, the success of the system depends upon a reliable, trouble-free drive.

Tannate-Rockwood Short Center Drive efficiency is due (1) to the ***pivoted*** Rockwood base and (2) to the high capacity Tannate flat leather belt. Variation in the load is immediately compensated for by the weight of the motor on the pivoted base, which automatically adjusts the belt tension.

Thus, there is no interruption in the transmission efficiency of the Tannate leather belt, which is designed to grip tightly, run smoothly and pull steadily.

Consult Rhoads Engineering service. Let us tell you about Tannate-Rockwood Drive applied to ***your*** air-conditioning problems.

**RHOADS**
*Tannate-Rockwood*
**SHORT CENTER DRIVES**

**J. E. RHOADS & SONS**
35 North Sixth Street Philadelphia 6, Pa.
Established 1702 • NEW YORK • CHICAGO • ATLANTA

the company's procedure for cleaning steam turbines. The booklet contains examples of applications in industrial space heating in the form of testimonial letters. Serving as an introduction to the domestic field, the booklet is written primarily for the home owner.

### Industrial Stoker

No. 6024—A brief description of construction features together with photographs of actual installations are included in the 4 p. booklet covering industrial stokers issued by the Whitty Co., Inc., 86 Western Ave., Boston 24, Mass. The manufacturer's statements as to total savings in comparison with hand fired installations are featured.

### Leather Packings

No. 6025—A 4 p. folder on leather packings of such shapes as cup, flange, vee, and U, has been issued by Alexander Bros., 406 N. 3rd St., Philadelphia 23, Pa. Recommendations as to tannage and treatment for various types of service together with price lists and directions for ordering are included.

### Lime Scale and Slime Removing Compound

No. 6026—Two 4 p. bulletins in a report form describing the treatment of make up water for evaporative condensers and coolers and water treatment in various types of humidifying systems have been issued by Oakite Products, Inc., 22 Thames St., New York 6, N. Y. The use of a new material, "Airefiner No. 52," as well as other products of the company are described in connection with the prevention and control of lime scale and slime or algae.

### pH and Chlorine Control

No. 6027—A completely revised combination handbook and catalog discusses the meaning of pH control, the scale used, the two basic methods of control, and lists approximate pH values for various acids, bases, biologic materials, and foods. Considerable space is devoted to a discussion of the application of pH, chlorine, phosphate, bromine, chromate, and nitrate control in 35 industries. Offered by the W. A. Taylor & Co., 7300 York Rd., Baltimore 4, Md., the booklet also contains precautions to be observed in making determinations and describes the various outfits (including eight new sets) offered by this company.

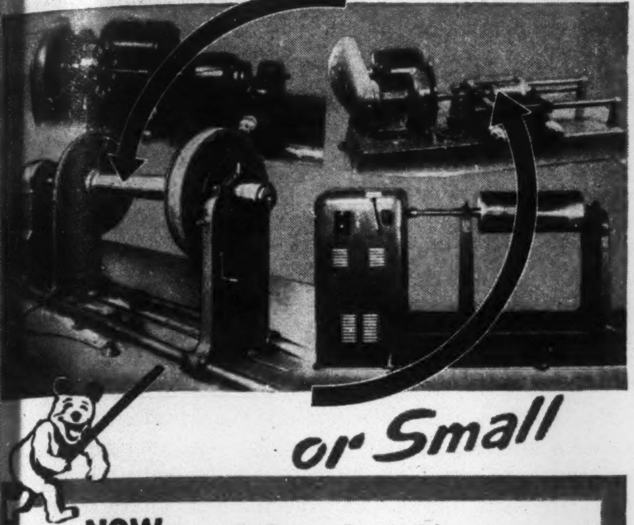
### Refrigeration Control Instruments

No. 6028—A 36 p. booklet (No. 300) dealing with the application of control instruments to the refrigeration field and describing various instruments has been issued by the Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y. Some typical applications are briefly described and illustrated by means of photographs and schematic diagrams for the purpose of showing certain processing requirements. The description of the manufacturer's control instruments includes information as to sizes, temperature and pressure ranges, and provides other pertinent data.

### Refrigeration Leak Detector

No. 6029—"Trace," when added to the refrigerant charge of any system, will indicate leaks by the presence of a red stain at the point of leakage—so says

For rotating bodies
Large



or Small

NOW . . . A Complete Line of
BEAR DY-NAMIC BALANCING MACHINES
DRIVE OUT THE "WOBBLIES"
Quicker • Easier • at Lower Cost!

REDUCE WEAR
MINIMIZE VIBRATION
ELIMINATE NOISE
INCREASE EFFICIENCY
CUT MAINTENANCE

Dy-Namic Balancing of all rotating parts, from tiny armatures to heavy railroad car wheels, is recognized today as never before as *essential* to longer machine life and more efficient operation. Bear's new, but thoroughly proven Balancing Technique, and lower cost, easier-to-operate Balancing Machines, now make Dy-Namic Balancing of *all* rotating parts a *fast*, *simple* and *economical* operation.

Write for FREE BEAR INDUSTRIAL BALANCING BULLETIN, containing complete information on this essential equipment. It explains the Bear Dy-Namic Balancing Principle which makes Dy-Namic Balancing so simple that operators can be trained in a few hours. Illustrates and describes Bear's complete line of machines for balancing every rotating part from 4 oz. to 4000 lbs. Tells how you can cut the time and cost of Dy-Namic Balancing.

**BEAR MFG. CO., Dept. FMM,**
**Rock Island, Illinois**

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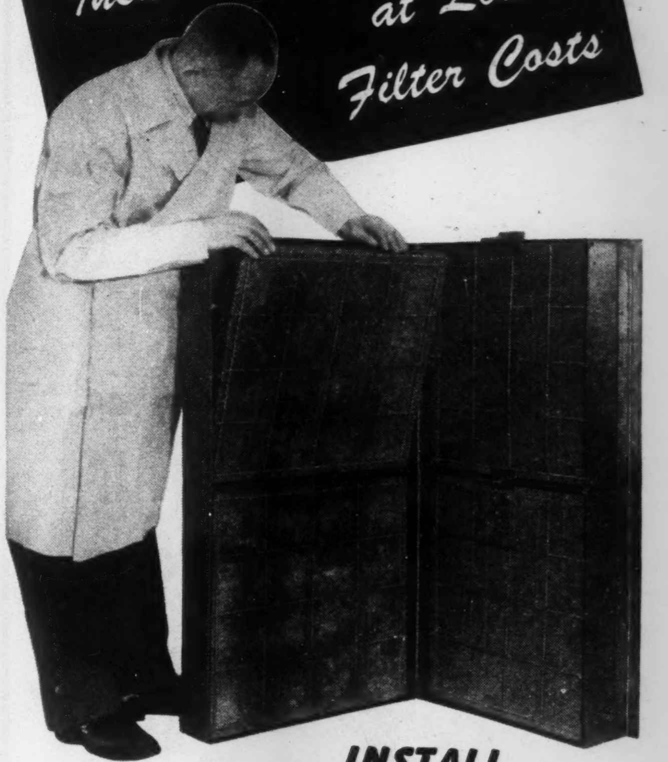
BEAR

Insure CLEANER AIR
at Lower
Filter Costs



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AIR FILTERS
In Filter Banks and
Industrial Dust Collectors

You catch and hold up to 300% more dust—insure higher air blower efficiency with these scientifically engineered air filters. Easy to install, easy to change.

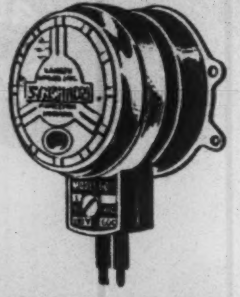
NO. 200 RE-FIL-ABLE WITH
SELF-SEALING EDGE

WRITE FOR FREE
TECHNICAL DATA
BOOKLET ON FILTERS
AND FILTER BANKS.

RESEARCH PRODUCTS CORP.
MADISON 3, WIS.

SYNCHRON TIMING MOTORS · TIME MACHINES

*Time Will Come*



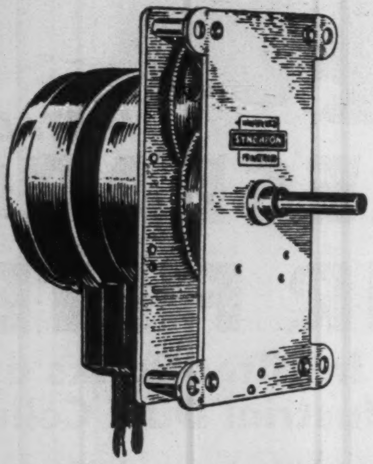
SOON

*— when you can get*

SYNCHRON

TIMING MOTORS

AND



TIMING MACHINES

—in the quantities you will need for increased production of timing devices of all kinds. Right now we suggest you make a note of these SYNCHRON features:

STANDARD SYNCHRON MOTORS are compactly built, with rotor and coil nested in a sturdy case 2¾" x 1-5/16"—with power to pull 8 oz. direct load continuously at 1 RPM. They are built for speeds of 1 to 300 RPM, clockwise, or counter-clockwise, in all voltages and cycles.

STANDARD SYNCHRON TIMING MACHINES are geared to operate at intervals of 1 RPM, 1 RPH, 1 RP12h, and 1 RPD. Any other interval desired can be supplied on special order.

*Write today for catalog and engineering data.*

HANSEN MANUFACTURING CO., INC.
PRINCETON 6, INDIANA

the 6 p. 6x3 in. pamphlet issued by the Highside Chemical Co., 195 Verona Ave., Newark, N. J. It is also stated that this liquid, which imparts a vivid red color to the oil and refrigerant, is very penetrating, is non-corrosive, will not form sludge, is thoroughly dehydrated, and will not affect the refrigerant or lubricating properties of the oil.

### Spring Pipe Hangers and Vibration Eliminators

No. 6030—The Power Piping Div., Blaw-Knox Co., 1525 Pennsylvania Ave., Pittsburgh 12, Pa., has issued a new 34 p. catalog (2026) illustrating and describing 14 types of spring pipe hangers of the internal swivel action type, including multiple rolling action types, and six types of vibration eliminators. Examples of various applications, together with tabulated data on dimensions and recommended loads, are included.

### Stainless Steel

No. 6031—Jessop Steel Co., Washington, Pa. has issued a new 8 p. folder describing the company's various types of stainless steel. The chemical composition, physical properties, mechanical characteristics, corrosion resistance data, and properties in fabrication are tabulated for various chrome-nickel iron alloys.

### Steam Control

No. 6032—The O. C. Keckley Co., 400 W. Madison St., Chicago 6, Ill., has issued a 40 p. 1945 catalog which illustrates and describes the steam and liquid control equipment offered by that company. The equip-

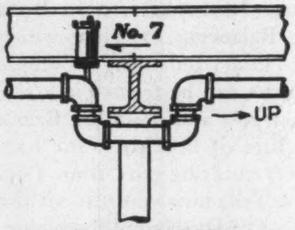
GET THAT AIR OUT OF THERE

*And Keep It Out With*

AUTO-VENT AIR ELIMINATORS

*Circulation Troubles?*

Don't fight air pockets or traps in hot or cold circulating lines. "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, convector radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish. For pressures up to 75 pounds.



Venting Trapped Mains and Circulating Lines.

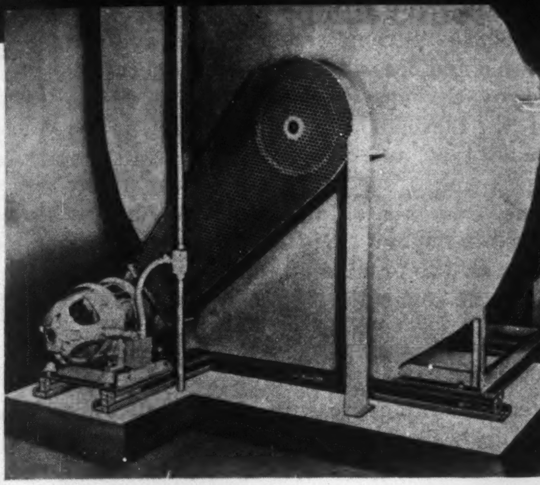
PLAY SAFE—USE THEM ON EVERY JOB

MAID-O'-MIST INC

AUTOMATIC HUMIDIFIERS FOR ALL TYPES OF HEATING SYSTEMS

3215 N. PULASKI RD.,
CHICAGO 41, ILLINOIS

ISOLATE
VIBRATION AND NOISE
*from*
FANS AND BLOWERS



**Typical installation of fan and motor on Korfund isolating fan base.**

KORFUND TWIN RAIL FAN BASE is a development in fan and blower isolation to assure efficient isolation of noise and vibration at an unusually low cost.

Interchangeable prefabricated parts are used throughout. It is light in weight, yet has great rigidity to vertical and lateral stresses. The Twin Rail Base is easily assembled and installed. Caps designed to hold fan and motor housings are securely clamped, yet can be repositioned by unlocking a single nut. Isolators provide uniform loading and can also be repositioned to compensate for unequal weight distribution.

*Write for Bulletin TR-800 for further information on Korfund Twin Rail Fan Base.*

KORFUND
VIBRATION
CONTROL

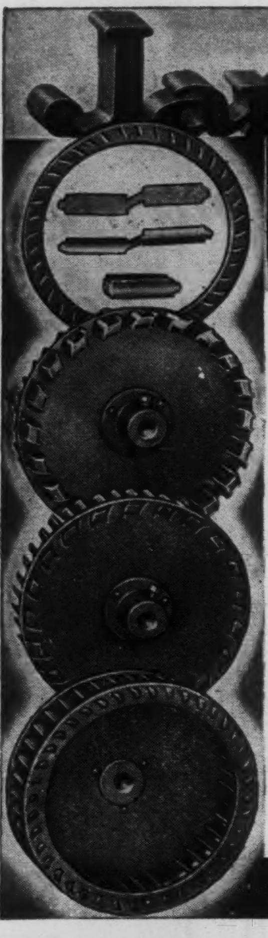
THE KORFUND COMPANY, Inc., 48 36 32nd ST., LONG ISLAND CITY 1, NEW YORK

*When you think of a great "name" in Music..... you think of* **MOZART**

*When you think of a great "name" in Oil Burners you think of*

QUIET
MAY
OIL BURNER

MAY OIL BURNER DIVISION
GEROTOR MAY CORP.
BALTIMORE 3, MD.



Janette

Blower Wheels

**5 to 12 in.**

**These Illustrations Show the Patented Construction of a Janette Wheel.**
The blades are formed in pairs for rigidity. The blade slots in the steel discs are die cut to ensure exact spacing of the blades. The hub is riveted to the back plate; then the blades are inserted into the slots. After the blades are spot welded to the back plate the tips are pressed thru the slots of the inlet disc, then rolled down against the disc.

**The Inherent Spring of the Blades Keeps Them Tight.**

**Because of This Construction, Janette Wheels have given over 19 years of universal satisfaction** to internationally known manufacturers of coal stokers, blowers, ventilating equipment, air cooled engines, oil burners, superchargers, dust collectors, drying and fire detection apparatus. **It Will Pay You to Give Janette Blower Wheels a Trial!**

**May We Send Literature?**

Janette Manufacturing Company
556 W Monroe St Chicago 6, Ill.

ment described includes such items as pressure regulating valves, pump governors, temperature regulators, relief and float valves, strainers, water gages, gage cocks, and steam traps.

### Steam Jet Air Ejector Vacuum Pumps

No. 6033—Various types of "Tubejet" vacuum pumps for air ejection are illustrated by means of photographs in a new 4 p. leaflet (Bulletin No. 944) issued by the C. H. Wheeler Mfg. Co., 19th, Leigh & Sedgley Ave., Philadelphia 32, Pa. Among those shown are the standard type with surface inter-after condenser, special type for high pressure and high superheat, standard type with jet inter-condenser, and the marine type with surface inter-after condensers.

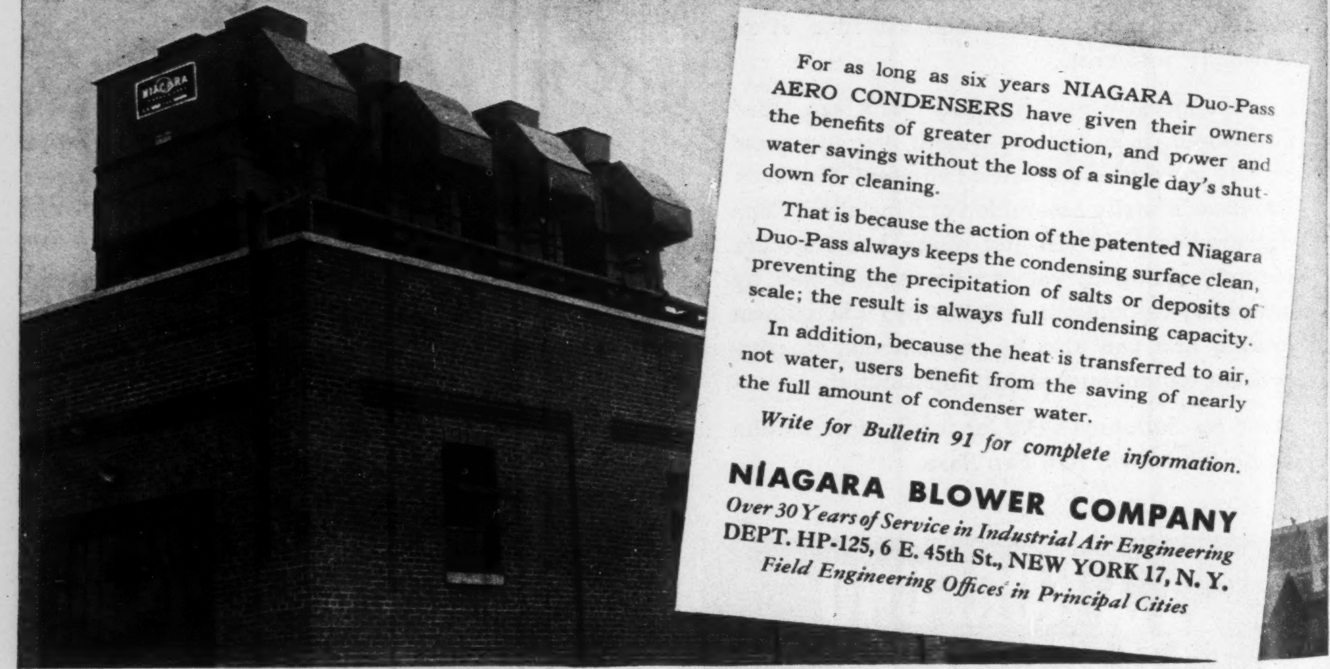
### Steam Traps and Strainers

No. 6034—"Strong" steam traps and strainers are illustrated and described in a new 24 p. catalog (No. 67) issued by Strong, Carlisle & Hamond Co., 1392 W. Third St., Cleveland, O. Open bucket, inverted bucket, expansion type, and ball float steam traps, together with strainers and a special line of open bucket traps for gasoline, ammonia, oil, and other liquids, are described. Featured is the new "Hi-Cap" inverted bucket type trap which is said to provide up to 25 per cent greater capacity than the company's former types of similar size.

### Steel Boilers

No. 6035—Steel riveted firebox boilers for 100 to 150 psi steam working pressure and for all fuels—hand or mechanically fired—are described and illustrated in the

Get full capacity from your Refrigeration Plant!



For as long as six years NIAGARA Duo-Pass AERO CONDENSERS have given their owners the benefits of greater production, and power and water savings without the loss of a single day's shut-down for cleaning.

That is because the action of the patented Niagara Duo-Pass always keeps the condensing surface clean, preventing the precipitation of salts or deposits of scale; the result is always full condensing capacity.

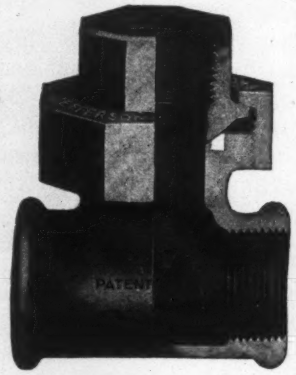
In addition, because the heat is transferred to air, not water, users benefit from the saving of nearly the full amount of condenser water.

*Write for Bulletin 91 for complete information.*

**NIAGARA BLOWER COMPANY**
*Over 30 Years of Service in Industrial Air Engineering*
DEPT. HP-125, 6 E. 45th St., NEW YORK 17, N. Y.
*Field Engineering Offices in Principal Cities*

NIAGARA "NO-FROST" COOLING SYSTEMS
AIR ENGINEERING EQUIPMENT

HE UNIONS
WITH THE
RECESSED
BRASS
SEAT



JEFFERSON SPECIALTY UNIONS

**Effect Big Savings in Labor**

Jefferson Union Tees with union on the outlet assure labor savings and better piping jobs because they take the place of an all-female union, two nipples and an ordinary tee. Three joints are thus saved. Available in All-Female and Male and Female threads.

The brass seating in these and all Jefferson Specialty Unions is an exclusive feature which, located in a recess away from the runway of the fitting, leaves a straight bore assuring unrestricted flow in the pipe.

**JEFFERSON UNION CO.**
601 West 26th Street, New York 1, N. Y.

*Factories at*
exington 73, Mass. Lockport, N. Y.

QUALITY always wins!
MARTOCELLO
Products are fully
DEPENDABLE

ATOMIZING SPRAY NOZZLES
(1936) ½" P.S. MALE
(2300) 3/8 RS
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(2304) ½ RS
3/8 P.S. FEMALE
(1920)
(2308) ¾ RS
SPRAY POND NOZZLES
CONDENSER WATER DISTRIBUTORS
FOR VERTICAL SHELL AND TUBE CONDENSERS

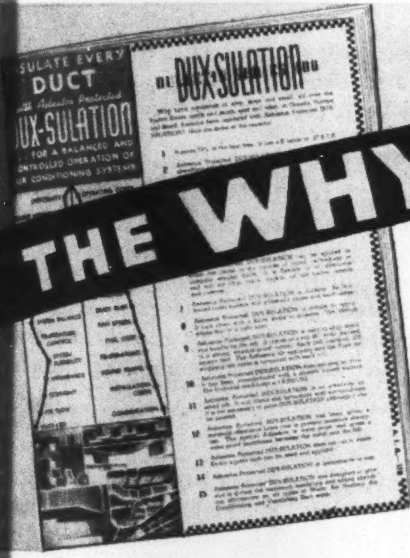
**ATOMIZING SPRAY NOZZLES, SPRAY POND NOZZLES, and CONDENSER WATER DISTRIBUTORS**
For Vertical Shell and Tube Ammonia Condensers

ALL MARTOCELLO SPRAY NOZZLES are manufactured with precision and of a design which has been thoroughly tested for maximum results and durability. They are guaranteed to give satisfaction. Successful, efficient results depend largely upon selecting the proper number, type and size of Nozzles suitable for your installation.

THE MARTOCELLO CONDENSER WATER DISTRIBUTORS are now used as standard equipment by Progressive Refrigerating Engineers in solving their Manpower problem, because they require no attention and assure users of the lowest Condenser Operating Pressures and Minimum Power Cost.

It will pay you to consult us. WRITE or WIRE for further information.

**Jos. A. Martocello & Co.** 229-231 NORTH 13th STREET
PHILADELPHIA 7, PA.
"Serving the Ice Industry Since 1916" "There is no Substitute for MARTOCELLO QUALITY"



THE WHY OF DUCT INSULATION!

**If you haven't read it—**
**You Can Get the Complete Story!**

The DUX-SULATION story of insulating Ducts is yours for the asking — simply fill in the coupon below and mail — it will prove to be of great value to you — each page is full of money-saving facts. You'll find it interesting reading — no obligation, of course.

**8 PAGES of Valuable Information!**

DUX-SULATION saves 75% of the bare duct heat loss—as high thermal insulating efficiency of 70% (K factor .27 .T.U.). Is ½" thick and has smooth surface giving an xceptionally low frictional resistance (F=0.0001322).

DUX-SULATION also deadens metallic noises when aplied to outside of ducts and will absorb 70% of air borne oises in less than 10 lineal feet of lined duct.

DUX-SULATION comes complete—nothing else to buy—6" wide roll contains 170 sq. ft. Quick and easy applicaion. Shipped complete with sufficient adhesive to glue he felt on the metal duct surfaces and special tape for orners and joints.

**GRANT WILSON, INC.**
141 WEST JACKSON BLVD. AT LA SALLE ST., . . CHICAGO 4, ILL.
(22nd Floor, Board of Trade Bldg. . . . Phone: Wabash 8220)

Send Bulletin No. 407-P containing the full story of DUX-SULATION—the all purpose insulation.

FIRM NAME ......................................

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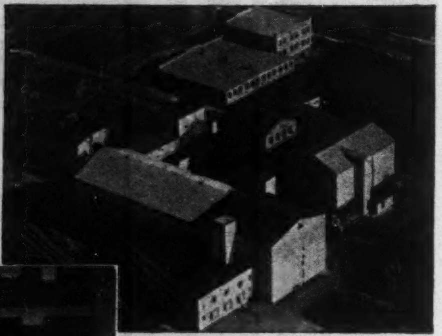
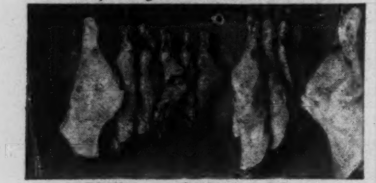
ATTENTION OF ....................................

*Air View of the Consumers Ice and Coal Co., Lancaster, Penna.*



*Making 90 Tons of Ice Daily*

*Preparing Foods for Lockers*



*Chilling and Ageing Meats*

*2200 Refrigerated Food Lockers*

*Bulk Food Processing Equipment*

*4 Frick Blizzard Freezers*

*Packaging Frozen Foods*

*Frozen Food Storage*

**Another Highly Successful Community Refrigeration Center**

**The Consumers Ice and Coal Co., Lancaster, Penna., provides refrigeration service to more than 2500 customers. • The plant has been making ice for over 40 years; now produces 90 tons daily, serves town and country routes, and ices refrigerator cars; but ice comprises only one-fifth of its business. • Its locker system is one of the largest and finest in the country; is complete with processing equipment, chilling and ageing rooms, quick-freezer, and 2200 food compartments; it also has 3 substations in nearby towns. • Thousands of pounds of locally grown fruits and vegetables are cleaned, graded, quick-frozen, packaged, and sold under the "Consumers" label, each season. Four Blizzard freezers handle this load. Six freezer storage rooms hold 3 million lb. of various frozen foods. • Fresh fruits (up to 75,000 bushels) are stored, not to mention carloads of such products as cheese, cream, cabbage, meats, potatoes, etc. • Frick refrigerating, ice-making, quick-freezing and cold storage equipment is used throughout. • A similar COMMUNITY REFRIGERATION CENTER could be of great service to YOUR town. Get in touch with your nearest Frick Branch Office, or write direct to**

**FRICK
COMPANY
Waynesboro, Penna.**

new 20 p. catalog (96E) issued by the Kewanee Boiler Corp., Kewanee, Ill. Overall dimensions and ratings as well as descriptive data are given for these boilers which range in size from 10 to 304 hp. Also described are the small, portable marine type "Scottie Jr." (6 to 30 hp., 100 psi working pressure) and the 50 to 150 hp. all-welded steel boiler.

### Thermocouples

No. 6036—A new edition of a thermocouple data book and catalog containing 32 pp. (S 2-6) includes descriptions, list prices, and recommendations on thermocouples, thermocouple wire, lead wire, heads, connectors, plug and socket assemblies, insulators, and protecting tubes. It also includes information on the selection and installation of these items and is issued by the Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill.

### Valve Renewable Parts Chart

No. 6037—A 22x28 in. chart printed in black and red is offered by the Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Bridgeport 2, Conn. The illustrations and data contained in the chart are arranged so as to provide a ready means for identifying replacement parts of the manufacturer's line of brass and iron valves. Instructions for ordering and replacing renewable parts are included.

### Water Demineralizer

No. 6038—The process of preparing clear water, the equivalent of commercially distilled, by ion exchange is described in a new bulletin (4181) issued by the Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa. This method for preparing water for process is said to offer opportunities for improved products and economies wherever there is a need for mineral-free water.

### Water Separator and Filter

No. 6039—The new "Excel-So" separator, for removing water and dirt from petroleum products in refineries, gasoline plants, pipe lines, and chemical plants, is described in a new bulletin (EX-101) which is available from Flotrol Systems, Inc., 385 Gerard Ave., New York 51, N. Y. Overall dimensions of the various sizes offered, together with performance data, are included in the bulletin.

### Welcome Folder

No. 6040—At the reception desk of the Foxboro Co., 106 Neponset Ave., Foxboro, Mass., each caller is given a small "welcome" folder which provides useful information concerning automobile highways, train and bus schedules, and a brief historical sketch of the town. The caller is also informed that he is welcome to use the company's garage and cafeteria facilities and—believe it or not—that after a five minute wait in the reception room (without an appropriate reason for the delay) he will be announced again to the person he wishes to see.

### Welded Steel Boilers

No. 6041—An 8 p. booklet, Bulletin No. S-67 (5th Ed.), illustrating and describing the manufacturer's "Standard" electric-welded, steel, fire tube boilers, has

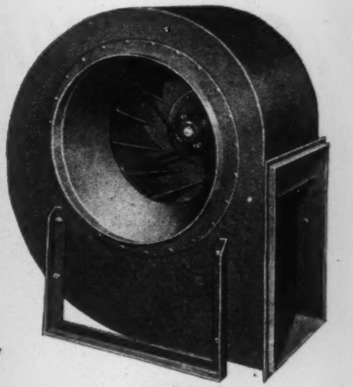
EFFICIENT
ECONOMICAL

De Luxe type WK Pressure Actuated Water Regulating Valves for Freon, Sulphur or Methyl, are pilot operated, modulating. Standard adjustable opening range from 50 to 150 lbs. Factory set to open at 90 pounds. Precision engineering and individual testing for low cost, satisfactory performance. Available in sizes of ¾ to 2 inches FPT. Simple adjustment—easily serviced.

*Other sizes and types are also available.*

**Electrimatic**
2100 INDIANA AVE. CHICAGO 16, ILL.

**"GENERAL" MULTIBLADE EXHAUSTERS**



**Improved designs of "Those Quiet Ones"**

Universally Recognized at THE Types

**Exactly adapted to the Exacting requirements of Heating, Ventilating and Air Conditioning Services**

Forward and Backward Curved Blades
In all sizes, wheels 12 to 72 in.

**And forward curve "Juniors" with wheel diameters 6 to 10**

The whole story in Bulletin SC-102, with complete performance tables, dimensions, etc.—52 big pages. For your files on request.

**GENERAL BLOWER CO.**
*"Lungs for Industry"*

Morton Grove, Ill.
8601 Ferris Avenue

Chicago 10, Ill.
502 N. Dearborn St.

HAVE YOU INQUIRED HOW
**THERMONICS**
CAN IMPROVE, SIMPLIFY
YOUR PRODUCT, YOUR PLANT,
YOUR POST-WAR PLANNING

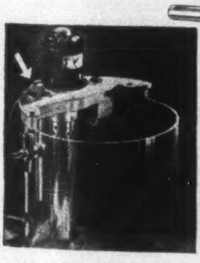
***THERMONICS** is the science of temperature control developed by Fenwal, Incorporated, by the direct process of determining the needs of industry and science for unerringly accurate thermal control of wide mutations.

Thermonics as a science in itself earns and deserves the attention of:

- all processes and production requiring regulation of extreme or moderate temperatures;
- makers of equipment requiring light weight, compact, efficient thermal regulation;
- makers and users of machinery, equipment, vehicles, wherein a safety factor of controlling or indicating excessive or dangerous mutations in temperature is essential.

**THERMOSWITCH** is the prime factor in Thermonics. THERMOSWITCH in its many types and adaptations, offers a lightweight, compact vibration-proof, highly sensitive yet rugged regulatory and detectory unit of almost unlimited utility.

*Fenwal's data folder on Thermonics will prove of value to engineers. Your copy is ready for you.*



**Fenwal, Inc.**
THERMOSWITCHES
FOR COMPLETE TEMPERATURE CONTROL
69 Pleasant Street, Ashland, Massachusetts

GASKET DATA

PRODUCTS RESEARCH CO.
634 S. WESTERN AVE.
LOS ANGELES 5, CAL.

*Chrome Lock for Refrigeration*

**CHROME LOCK GASKETING has been successfully serving the Navy in refrigerator construction on board ship for a number of years. Chrome Lock does not contaminate foods nor drinking water. It can be used as an insulator in both commercial and household refrigeration jobs. Rust-arresting—non-corrosive — non-oxidizing — anti-squeak. Chrome Lock gives a longer life and is less expensive than other forms of gasketing. Chrome Lock is made of a felt base impregnated with a chromate pigmented compound that makes it flame and fire-resistant.**

Chrome Lock

USE COUPON FOR FREE SAMPLE

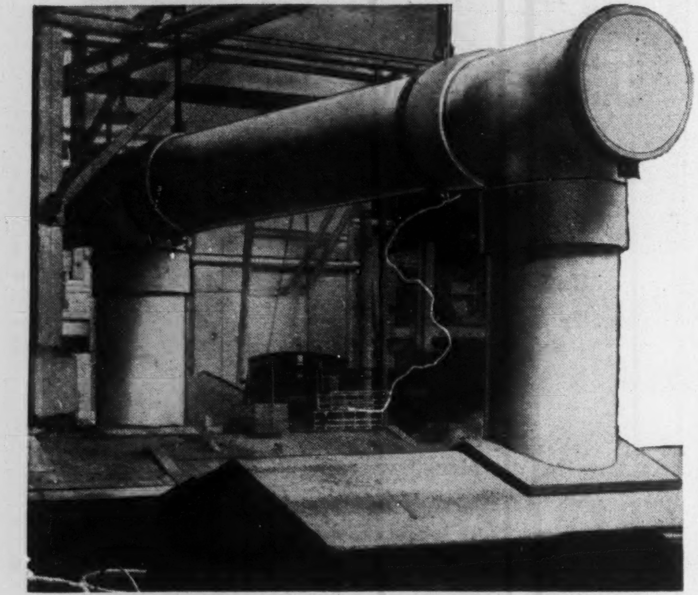
PRODUCTS RESEARCH CO.,
634 S. WESTERN AVE., LOS ANGELES 5, CALIF.
Without obligation, send me FREE sample of Chrome Lock Gasketing.

NAME ................................................

ADDRESS ................................................

CITY.................... ZONE...... STATE............

FIGHTS CORROSION!



Transite asbestos-cement ducts resist corrosive attack by many vapors, fumes, gases

WHERE corrosion problems must be met in venting systems, many users find the trouble-saving answer in Transite "S" Pipe. Made of asbestos and cement, it cannot rust . . . successfully resists many corrosive fumes, vapors, dusts, gases, etc., encountered in industrial operations.

**Strong and durable,** Transite "S" Pipe can be used indoors or out—for ducts, vents or stacks. It is highly weather-resistant—needs no painting.

Installation of these modern asbestos-cement ducts is simple. Light in weight and readily assembled, Transite "S" Pipe comes in a range of 19 sizes, in diameters from 2" up to 36". A complete line of fittings is available.

* * *

**For complete information,** write today for data sheets DS Series 336. Address Johns-Manville, 22 East 40th Street, New York 16, New York.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE 'S' PIPE

been issued by the Brownell Co., 408 N. Findlay St., Dayton 1, O. Overall dimensions, SBI ratings, and other pertinent data are included for the low water line and high leg types. All boilers are constructed in accordance with ASME code regulations.

### Welding Inspection

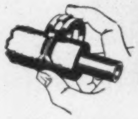
No. 6042—The type KH-2 unit, used for the inspection of weldments by the magnetic particle method, is described in a new 1 p. leaflet (form 136) issued by the Magnaflux Corp., 5900 Northwest Highway, Chicago, Ill. This portable unit, it is said, is suitable for a wide variety of applications as it provides both high amperage, low voltage current for d-c magnetization, high amperage low voltage current for a-c magnetization of parts and demagnetization after inspection. In addition dry plate rectifiers deliver single phase, half wave rectified current for d-c magnetization. Also issued by Magnaflux Corp. is a reprint from the October issue of the Welding Journal of an article on Routine Inspection and Salvage of Machinery Weldments by James W. Owens, director of welding for Fairbanks, Morse & Co., Beloit, Wis. In the article some developments in weld inspection and salvage techniques are discussed together with some comments in regard to non-relevant indications due to unfused root faces.

### Increase in Price of Stokers

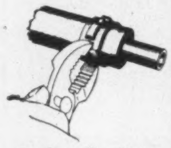
Stoker manufacturers have been given an industry-wide increase over October 1, 1941, prices in an action effective November 8 when the OPA permitted a 5 per

★ The New TINNERMAN HOSE CLAMP

SPEED CLAMP on water valve of automatic home washer.



Latch by hand



Lock with pliers

Remove with screwdriver

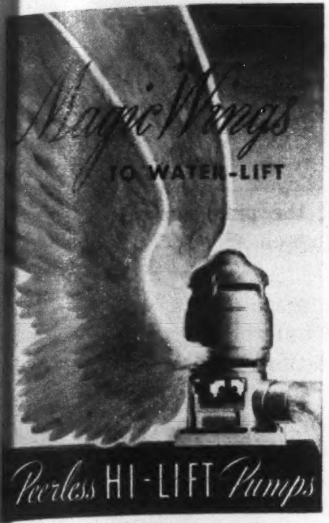
SPEED CLAMP ADVANTAGES

1. One piece—no bolts, gears, thumbscrews.
2. Exclusive, self-locking, ratchet design.
3. Faster and easier to install or remove.
4. Uniform pressure provides leak-proof grip.
5. Low profile—no protruding mechanism.
6. May be used over and over again.

Write for literature

TINNERMAN PRODUCTS, INC.
2018 Fulton Road, Cleveland 13, Ohio

Speed Nuts
PATENTED
FASTEST THING IN FASTENINGS...OVER 3000 SHAPES AND SIZES



**AMERICA'S largest selling PUMPS Provide Water For Industrial Service, Domestic Uses & Irrigation** • Peerless offers the most complete line of vertical and horizontal pumps. Because of the extensiveness of the line, a pump of the size and exact type best suited for your pumping conditions, which makes for greatest economy of operation, is available to you. The Hi-Lift illustrated here is furnished in sizes of from 500 to 3,500 gallons per hour. The Hydro-Foil (Propeller Type) up to 220,000 gallons per minute.

## DOMESTIC WATER SYSTEMS

***The Water King,*** shallow well type, utilizing the HI-LIFT principle ingeniously applied in simplest form, in sizes up to 1,300 gallons per hour. **The Peerless Jet Pump,** for deep or shallow wells, is available in sizes up to 5,000 gallons per hour.

*Peerless Distributors and Direct Factory Representatives Located In All Principal Cities*

## PEERLESS PUMPS

**PEERLESS PUMP DIVISION**
**Food Machinery Corp.**

VERTICAL &
HORIZONTAL

FACTORIES
LOS ANGELES 31, CALIFORNIA
301 West Avenue Twenty-six
QUINCY, ILL. • CANTON 6, OHIO

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SHAPE BOOK
#6

## The COMMERCIAL SHEARING AND STAMPING COMPANY

YOUNGSTOWN 1, OHIO

Requirements for circular stampings can be satisfied in many cases by using "COMMERCIAL" Standard Shapes—as listed in "SHAPE BOOK" No. 6 . . . Write for a Copy

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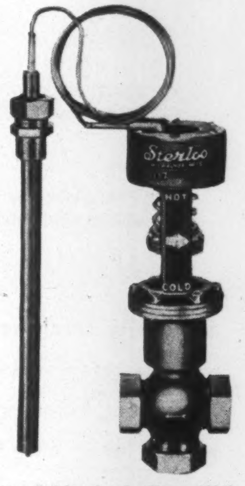
## CONTROL PROCESSING TEMPERATURES *Accurately*

## STERLING Control No. 117

WHATEVER your process control requirements, you'll get better results with this single seated, tight-closing, balanced pilot operated valve. Sterling Series No. 117 Control.

Built for steam pressures up to 125 lbs. Sensitive, quick-acting, functioning upon a drop in air or liquid temperature of 1/2 degree. Assures close, dependable regulation of temperature to desired setting.



Available in 3 Sizes—1¼", 1½", and 2", with standard range of 130° to 170° plus other special ranges.

Your JOBBER CAN quote you. Write for latest Bulletin No. 451 covering "Sterling" Temperature Controls.

**Sterling, INC.** **3738 N. Holton St., Milwaukee 12, Wis.**

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### COMPRESSED AIR LINE PURIFICATION YOUR PROBLEM?

***Here's the Answer...***

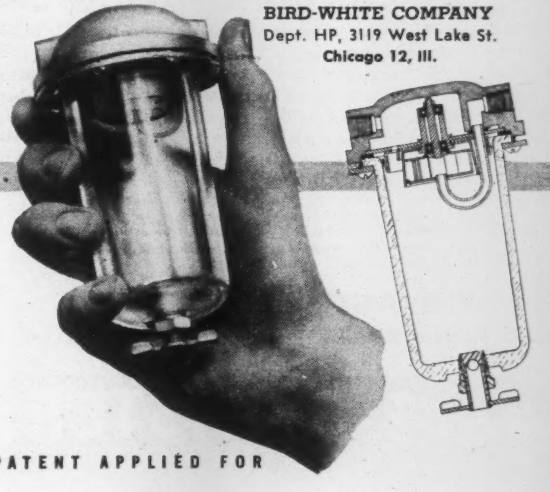
The new Bird-White Pur-O-fier A-1 assures you of positive elimination by turbo-rotor centrifugal action of all free moisture, oil and foreign matter in small compressed air or gas systems. It operates with from 1 to 5 cubic feet of air (1 to 75 p.s.i.) and for intermittent operation is extremely sensitive.

Among many other uses this new unit is ideal for protecting air pressure operated machinery and instruments from corrosion and gumming.

For complete specifications and applications write today for Bulletin No. 11.

Bird-White Pur-O-fiers are also available in other models for purification of large volumes of compressed air or gas. Ask for Bulletin No. 10.

**BIRD-WHITE COMPANY**
Dept. HP, 3119 West Lake St.
**Chicago 12, Ill.**



PATENT APPLIED FOR

*Difficult* CLEANING PROBLEMS?

IN STEAM OR HOT WATER SYSTEMS

**RID-AL Service**

**PROGRESSIVE ENGINEERS** keep their heating plants operating continuously at top efficiency by taking advantage of RID-AL Service.

We exclusively offer this complete service which consists of three individual treatments for eliminating SLUDGE and all other foreign matter from your entire heating system.

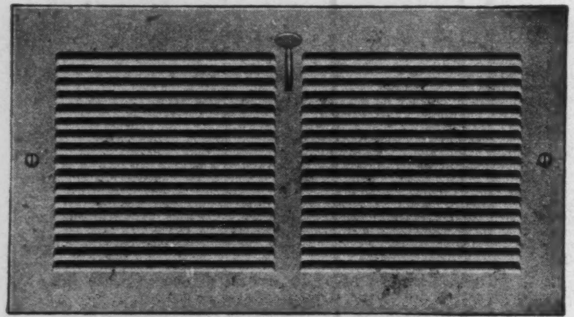
RID-SLUDGE thoroughly cleans all pipe lines, traps, valves, etc.

BOYLOUT cleans the boiler itself.

PROTEX deposits a protective film thruout the heating system and retards further deposits. All of the above chemicals are neutrals, harmless to metals. Our methods are proven, safe and guaranteed to satisfy. The more difficult the job, the better we can serve you.

*We offer you "CONSULTATION WITHOUT OBLIGATION" in solving your cleaning problems. Write us in detail your particular trouble. We solve the most difficult problems daily.*

**APEX ENGINEERING COMPANY**
**Suite 200-205 W. Wacker Drive** **Ran. 7100**
**Chicago 6, Illinois**


*No. 7032 Airo-Flex Adjustable Register*

**AIR DIRECTIONAL REGISTERS**

**This model is a simple, sturdy, moderate priced register suitable for most forced air heating jobs. Modern and pleasing in appearance, it has single louvre and bendable fins, set when delivered at about 22° downward. Furnished for wall and baseboard registers and intakes. It's an efficient, easily installed register, which does not run up the cost where the job must be kept within limits.**

Auer offers a complete line of floor, base, and wall registers and return faces, for gravity or air conditioning systems—including all air directional types. We also make flat metal grilles. Ask for Auer Register Book—or special Grille Catalog "G."

**THE AUER REGISTER CO.**
**3608 Payne Ave.** **Cleveland 14, O.**

*Auer* **REGISTERS**
& GRILLES for AIR CONDITIONING & GRAVITY

cent increase in the sales prices of stokers ranging in size from 50 to 1200 lb per hr and a 10 per cent increase for those under 50 lb per hr. Stoker parts are also included in this increase.

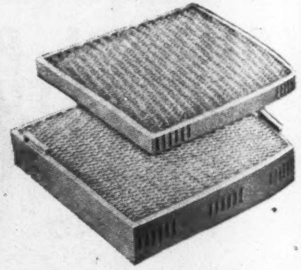
Resellers may pass on the dollar and cent amount of the increase, OPA said, when the stokers or parts are sold separately. However, if they are sold as a part of a larger unit (package job), the price increase must be absorbed by the manufacturer selling the combination.

In the event that any manufacturer has ceilings established under the mechanical building equipment regulation (maximum price regulation 591) that are higher than those which would be computed by applying these price increases to his October 1941 prices, he may keep his established ceiling prices.

This action, which constituted amendment No. 1 to order No. 48 under maximum price regulation No. 591—specified mechanical building equipment, will result in an overall industry price increase of about 6.7 per cent, says OPA. This estimate is based upon the assumption that the prewar proportion of small to large size stokers will be maintained.

### Acquires Control of Baker Ice

Control of the Baker Ice Machine Co., Inc., Omaha, Neb., and its subsidiary, Northwest Baker Ice Machine Co., Seattle, has been purchased by two companies in the Equity Group of investment companies. Announcement of the purchase, for an undisclosed amount, was made by R. L. Baker, president, of Omaha, who, with

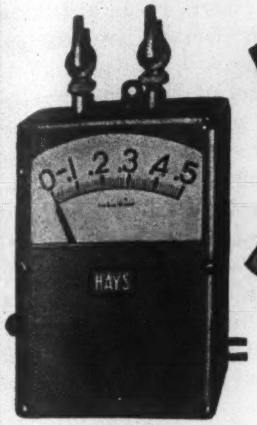

FOR IMPROVED AIR FILTERING... GREATER CAPACITY ...REDUCED COSTS

*Badger* **HEAVY DUTY PERMANENT**
***INDUSTRIAL FILTERS***

**Specially Designed** for extra heavy duty and industrial air cleaning services, the BADGER Heavy Duty Permanent Filter provides definitely improved air filtering, lower air resistance, greater dust-holding capacity, as well as reduced costs of maintenance. In addition, longer filter life is assured. Built in 2" and 4" sizes.

***Write for Catalog—Prices***

*Badger* CORPORATION
343 East Brown Street
Milwaukee 12, Wisconsin



HOW DIRTY ARE YOUR FILTERS?

THIS GAGE TELLS

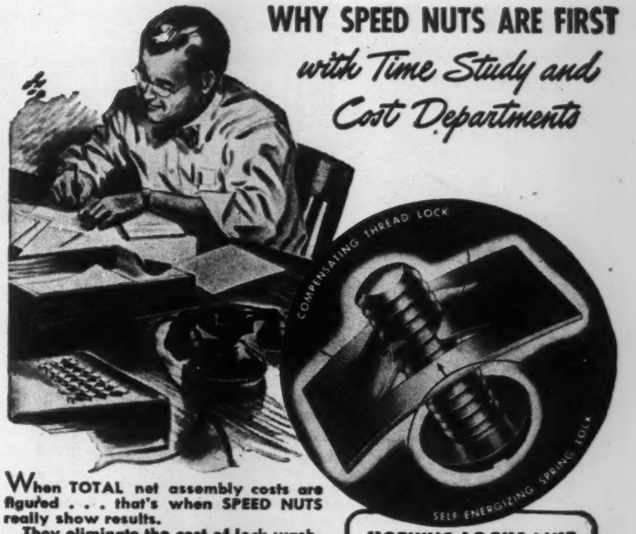
**HAYS AIR-FILTER GAGE**

- *Automatic*
- EASY TO INSTALL
- SAVES MONEY
- ELECTRICALLY OPERATED

If you are confronted with the problem of not knowing when the collected dirt in your filters is of sufficient density to decrease operating efficiency, install a HAYS Air-Filter Gage. The HAYS indicator shows amount of air resistance at all times—tells when to renew filter element—eliminates guess work—can be made to sound alarm when resistance is excessive. Write for full information. Ask for HAYS Bulletin A-F G.

The HAYS CORPORATION
COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A.

WHY SPEED NUTS ARE FIRST
*with Time Study and Cost Departments*



When TOTAL net assembly costs are figured . . . that's when SPEED NUTS really show results.

They eliminate the cost of lock washers and the time to stock and install them. Also, hundreds of SPEED NUTS are designed to perform multiple functions and eliminate two or more parts.

SPEED NUTS are applied faster. They can't "clog" with paint. "Self-retaining" types eliminate expensive welding and clinching. And SPEED NUT spring-tension resiliency also protects porcelain, plastic or glass parts against damage in transit.

Describe your fastening problem and we will show you how SPEED NUTS will reduce YOUR costs, too.

**NOTHING LOCKS LIKE A SPEED NUT**

As the screw is tightened, the two arched prongs move inward to provide a compensating thread lock against the thread root. Compression of arch in prongs and base creates a *Self-Energizing* spring lock that prevents vibration loosening.

TINNERMAN PRODUCTS, INC. • 2018 Fulton Road, Cleveland 13, Ohio

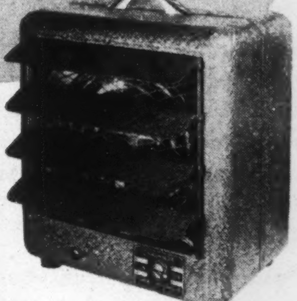
*Speed Nuts**
PATENTED
*Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS . . . OVER 3000 SHAPES AND SIZES

*For that Important EXTRA HEAT*

IN
- Plant Offices
- Stock Rooms
- Warehouses
- First Aid Rooms
- Watchmen Shelters

and all other isolated or hard-to-heat locations.



BLOWER TYPE
**CHROMALOX** *Electric*
**UNIT HEATERS**

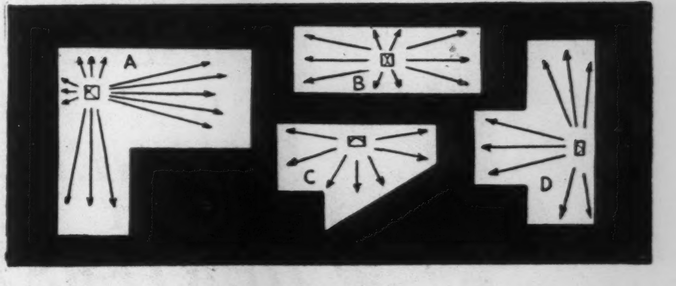
These ruggedly constructed CHROMALOX Unit Heaters meet the demands of industry for long, trouble-free life. Air is heated by sheath-encased CHROMALOX Koilstrips and forced through adjustable louvers by quiet, motor-driven fan. Automatic temperature control protects against overheating. 1.5 to 4 KW; 115 or 230 volts.

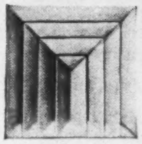
Write for catalog 42 and "100 Ways To Apply Electric Heat" booklet.

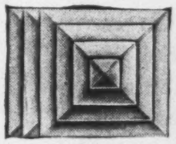
EDWIN L. WIEGAND CO.
7610 THOMAS BLVD. PITTSBURGH 8, PA.

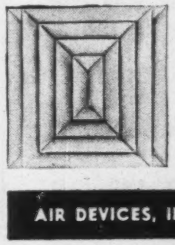
CHROMALOX
IB-22
ELECTRIC HEATING AT ITS BEST

WHAT DIFFUSERS FOR THESE AREAS?









AGITAIR TYPE R AIR DIFFUSERS
FOR DIFFUSION PATTERN CONTROL

Perfect diffusion of air into all parts of odd-shaped rooms is available only with Agitair Type R Air Diffusers. And you don't need to mount type R in the center of the space.

That's because Agitair Type R, assembled from standard parts to any pattern desired, can divide the incoming air into one, two, three, or four streams, and diffuse these streams into the room in exact proportion to the areas they serve. Temperature differential and duct velocity are dissipated rapidly, noiselessly, draftlessly. Get the facts from Air Devices, Inc.

AIR DEVICES, INC. 17 EAST 42nd STREET NEW YORK 17, N. Y.

his brother, C. A. Baker of Glen Ridge, N. J., and their brother-in-law, H. G. Kelly, also of Omaha, are retiring as active managers of the company.

The name and present personnel of the company are expected to be retained by the new owners, who are planning to supply new management and to strengthen the organization further with ample financing for expansion, research, and sales promotion. William B. Winslow, vice-president and general manager, has recently announced the appointment of Sterling F. Smith as general sales manager. Mr. Smith was formerly with the Mills Industries in Chicago as manager of that company's refrigeration division and prior to that was chief of the refrigeration and air conditioning section of the WPB.

Dependable! Efficient! Lasting!

APCO CONDENSATION RETURN UNITS
Simplex and Duplex
also
AURORA VERTICAL UNITS
Sizes up to 150 G. P. M.

—Available for Sale with Profit this Season

PUMPS "by Aurora" are PUMPS you can TRUST

Type OD Hor. Split-Case Double Suction Single Stage Centrifugal

Aurora Deep Well Turbines—4" to 24"

Apco Turbine-Type Pumps
The simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

NSA Aurora Centrifugal Sump Pump

Type GMC Close-Coupled Centrifugal

Type GGU Side Suction Single Stage Centrifugal

APCO Single Stage Turbine-Type

Write for CONDENSED CATALOG M or See Our Catalog in SWEETS.

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY
80 Loucks Street, AURORA, ILLINOIS

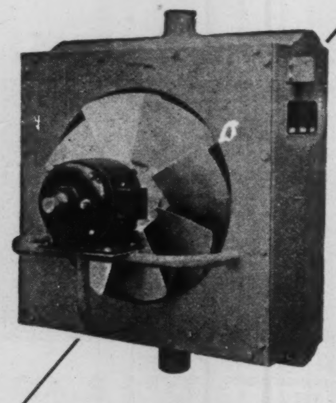
Erwin J. Davis

Consultant on Combustion and Heating Problems

ADVICE WORTH MORE THAN IT COSTS

Serving 48 States and Canada

4909 GLENWOOD AVENUE
Chicago 40, Illinois, U.S.A.



Quality First .. SINCE 1914

SKINNER UNIT HEATERS

Quality is a byword with Skinner Unit Heaters. Since 1914 they have been giving dependable service on a multitude of heating installations. The All-Steel Coils enable you to install these units with the knowledge that they will perform with the utmost efficiency and with the absolute minimum of service. Skinner builds a complete line of unit heaters . . . there's a type for any job and every requirement. Write now for literature . . . see for yourself.

SKINNER HEATING & VENTILATING CO., Inc.
Division of
ST. LOUIS BLOW PIPE AND HEATER CO., INC.
1948 N. 9th St., St. Louis 6, Mo.

RECONVERSION . . . . . YOUR OPPORTUNITY

Reconversion may be your opportunity to take part in a progressive program leading to your advancement.

The Austin Company is offering opporunities to Engineers who can design and/or prepare engineering drawings for industrial buildings and their facilities. Assignments are not for specific projects but are in our regular engineering staffs in long established offices, located on the East Coast, Central West, Gulf Coast and West Coast.

Positions are open to men possessing a sound background of education and experience and also to recent college graduates qualifying in—

MECHANICAL

Industrial Plant Equipment ★ Process Piping ★ Power Plants ★ Heating System ★ Air Conditioning and Ventilation ★ Conveying Systems ★ Plumbing and Sewers ★ Sprinkler Systems.

THE AUSTIN COMPANY
National Headquarters
16112 Euclid Avenue
Cleveland 12, Ohio

SECTION OF JANUARY 1945 HEATING, PIPING & AIR CONDITIONING

# 1945 DIRECTORY

*of*

## HEATING, PIPING, AND AIR CONDITIONING EQUIPMENT

*for*

## INDUSTRY AND LARGE BUILDINGS

### PART 1—PRODUCTS CLASSIFIED—Page 256

If you want to know the names of one or more manufacturers making a certain product, look in Part 1, where products are classified alphabetically in "directory style" with the noun governing (for instance, "unit heaters" are listed under "heaters, unit").

### PART 2—TRADE NAMES—Page 322

If you have the trade name of a product and want to know who manufactures it, look in Part 2, where trade names are alphabetically listed. Trade names the same as or identifiable from the company name are not listed. Manufacturers with such trade names can be easily identified under their product classification in Part 1.

### PART 3—MANUFACTURERS' ADDRESSES—Page 336

For the complete name and address of any manufacturer look in Part 3.

● The manufacturers whose names are spotted throughout the listings advertise in this issue. See Index to Advertisers (on last page) for the page on which you will find the advertising of any of these manufacturers.

Heating, Piping & Air Conditioning
Chicago, Illinois

## DIRECTORY SECTION

# HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

# PART 1—PRODUCTS CLASSIFIED

### ABSORBERS, VIBRATION

*See Hose, Metal and Fittings; Bases and Pads, Vibration Isolating*

### ABSORBERS, VIBRATION, FOR REFRIGERANT LINES

- American Metal Hose Branch, American Brass Co., Waterbury, Conn.
- Atlantic Metal Hose Co., Inc., New York, N. Y.
- Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.
- Chicago Metal Hose Corp., Maywood, Ill.
- Everhot Products Co., Chicago, Ill.
- Packless Metal Products Corp., New Rochelle, N. Y.
- Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa.
- Seamlex Co., Inc., Long Island City, N. Y.
- Titeflex, Inc., Newark, N. J.
- United Metal Hose Co., Inc., Long Island City, N. Y.
- Zallea Brothers & Johnson, Wilmington, Del.

### ABSORPTION DEHUMIDIFIERS

*See Dehumidifiers, Absorption and Adsorption*

### ABSORPTION REFRIGERATION MACHINES

*See Machines, Refrigeration, Absorption*

### ACCUMULATORS, REFRIGERATION (FOR AIR CONDITIONING)

- ● Acme Industries, Inc., Jackson, Mich.
- American Injector Co., Detroit, Mich.
- Boester, Carl F., St. Louis, Mo.
- Frick Co., Waynesboro, Pa.
- McQuay, Inc., Minneapolis, Minn.
- Richmond Engineering Co., Inc., Richmond, Va.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Temprite Products Corp., Detroit, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.

### ADJUSTABLE WRENCHES

*See Wrenches, Adjustable*

### ADSORBERS, ODOR

- Betz Corp., Hammond, Ind.
- Carbide and Carbon Chemicals Corp., New York, N. Y.
- ● Connor Engineering Corp., W. B., New York, N. Y.
- Refinite Corp., Omaha, Neb.

### ADSORPTION DEHUMIDIFIERS

*See Dehumidifiers, Absorption and Adsorption*

### AFTERCOOLERS, COMPRESSED AIR

- Adams Co., Inc., R. P., Buffalo, N. Y.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- American Locomotive Co., Alco Products Div., New York, N. Y.
- Andale Co., Philadelphia, Pa.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Bethlehem Steel Co., Bethlehem, Pa.
- Brown Fintube Co., The, Elyria, O.
- Bury Compressor Co., Erie, Pa.
- Chicago Pneumatic Tool Co., New York, N. Y.
- Croll-Reynolds Engineering Co., Inc., New York, N. Y.
- Downingtown Iron Works, Downingtown, Pa.
- Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
- ● Ingersoll-Rand Co., New York, N. Y.
- Johnson Corp., Three Rivers, Mich.
- ● Modine Mfg. Co., Racine, Wis.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- Parks-Cramer Co., Fitchburg, Mass.
- Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Pennsylvania Pump & Compressor Co., Easton, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Ruemelin Mfg. Co., Milwaukee, Wis.
- Schutte & Koerting Co., Philadelphia, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Struthers Wells Corp., Titusville, Pa.
- Tippett & Wood, Phillipsburg, N. J.
- ● Trane Co., The, La Crosse, Wis.
- Worthington Pump & Machinery Corp., Harrison, N. J.
- ● Young Radiator Co., Racine, Wis.
- Zallea Brothers & Johnson, Wilmington, Del.

### AIR AFTERCOOLERS

*See Aftercoolers, Compressed Air*

### AIR BREAK FITTINGS

*See Fittings, Drainage, Fixed Air Break*

### AIR CLEANERS

*See Cleaners, Air, Electrical*

### AIR COMPRESSORS

*See Compressors, Air*

### AIR CONDITIONERS

*See Units, Air Conditioning*

### AIR CONDITIONING UNITS

*See Units, Air Conditioning*

### AIR DIFFUSERS

*See Diffusers, Air, High Velocity; Grilles; Panels, Perforated for Air Diffusion; Registers*

### AIR DIFFUSION

*See Panels, Perforated, for Air Diffusion*

### AIR ELIMINATORS

*See Eliminators, Air*

### AIR FILTER GAGES

*See Gages, Air Filter*

### AIR FILTERS

*See Filters, Air*

### AIR FRESHENING

*See Compounds, Air Freshening; Adsorbers, Odor*

### AIR RECOVERY EQUIPMENT

*See Adsorbers, Odor*

### AIR SEPARATORS

*See Separators, Air*

### AIR VALVES

*See Valves, Radiator, Air*

### AIR VELOCITY METERS

*See Meters, Air Velocity, Direct Reading; Anemometers*

### AIR VOLUME METERS

*See Meters, Volume, Air and Gas*

### AIR WASHERS

*See Washers, Air*

### ALARMS, HIGH AND LOW BOILER WATER

- ● Combustion Control Corp., Cambridge, Mass.
- ● Illinois Engineering Co., Chicago, Ill.
- Johnson Corp., Three Rivers, Mich.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Lunkenheimer Co., Cincinnati, O.
- ● McAlear Mfg. Co., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Reliance Gauge Column Co., Cleveland, O.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Wheelco Instruments Co., Chicago, Ill.
- Wright-Austin Co., Detroit, Mich.
- ● Yarnall-Waring Co., Philadelphia, Pa.

### ALARMS, SMOKE

- American District Telegraph Co., New York, N. Y.
- ● Au-Temp-Co Corp., New York, N. Y.
- Bailey Meter Co., Cleveland, O.
- Boiler Room Equipment, Inc., New York, N. Y.
- Brooke Engineering Co., Inc., Philadelphia, Pa.
- Cooper Co., Clark, Palmyra, N. J.
- Photoswitch, Inc., Cambridge, Mass.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Worner Products Corp., Chicago, Ill.

### ALUMINUM COATED SHEETS

*See Sheets, Aluminum Coated*

### ALUMINUM SHEETS

*See Sheets, Aluminum*

● Advertisement in this issue. See Index to Advertisers, page 350.

## ANALYZERS, CARBON DIOXIDE, PORTABLE

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Barclay, Inc., Robert, Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Dwyer Mfg. Co., F. W., Chicago, Ill.
Eimer & Amend, New York, N. Y.
Ellison Draft Gage Co., Chicago, Ill.
Engelhard, Inc., Chas., Newark, N. J.
General Scientific Equipment Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
Hotstream Heater Co., Cleveland, O.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Precision Control Co., San Francisco, Calif.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Mfg. Corp., New York, N. Y.
Service to Industry, West Hartford, Conn.
Uehling Instrument Co., Paterson, N. J.
Weaver Mfg. Co., Springfield, Ill.

## ANEMOMETERS

American Instrument Co., Silver Spring, Md.
Barclay, Inc., Robert, Chicago, Ill.
Detroit Air Conditioning Service Co., Inc., Detroit, Mich.
Eimer & Amend, New York, N. Y.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Taylor Instrument Companies, Rochester, N. Y.
Wallace & Tiernan Co., Inc., Newark, N. J.
Willson Products, Inc., Reading, Pa. (Thermometer type)

## ANGLE VALVES

*See Valves, Angle*

## ANGLES, BARS, BEAMS, CHANNELS AND TEES (LIGHT WEIGHT SHAPES)

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Aluminum Co. of America, Pittsburgh, Pa.
● American Brass Co., Waterbury, Conn.
American Sheet Metal Works, New Orleans, La.
Atlantic Steel Co., Atlanta, Ga.
Bethlehem Steel Co., Bethlehem, Pa.
Brasco Mfg. Co., Harvey, Ill.
● Byers Co., A. M., Pittsburgh, Pa.
Carnegie-Illinois Steel Co., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
Columbia Steel Co., San Francisco, Calif.
Decatur Iron & Steel Co., Decatur, Ala.
Dow Chemical Co., The, Midland, Mich.
Inland Steel Co., Chicago, Ill.
International Steel Co., Evansville, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Lees, John, Div., Serrick Corp., Muncie, Ind.
Mesker & Co., Geo. L., Evansville, Ind.
Milcor Steel Co., Milwaukee, Wis.
● Penn Galvanizing Co., Philadelphia, Pa.
● Republic Steel Corp., Cleveland, O.
● Revere Copper and Brass, Incorporated, New York, N. Y.
Sioux Steel Co., Sioux Falls, S. D.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Truscon Steel Co., Youngstown, O.
● Weirton Steel Co., Weirton, W. Va.
Werner Co., Inc., R. D., New York, N. Y.
● Youngstown Sheet & Tube Co., Youngstown, O.

## AQUASTATS

*See Thermostats*

## ARC WELDERS

*See Welders, Arc*

## ARC WELDING ELECTRODES

*See Electrodes, Arc Welding*

## ASBESTOS FIBER AND CEMENT PIPE

*See Pipe, Asbestos Fiber and Cement*

## ASBESTOS PACKING

*See Packing, Asbestos*

## ASH CONVEYORS

*See Conveyors, Coal and Ash*

## AXIAL FLOW FANS

*See Fans, Axial Flow, Pressure Type*

## BALANCING EQUIPMENT

*See Equipment, Balancing*

## BALANCING VALVES

*See Valves, Balancing*

## BALL BEARINGS

*See Bearings, Ball*

## BAROMETRIC CONTROLS

*See Controls, Draft, Barometric*

## BASES, MOTOR, TENSION ADJUSTING

Ackermann Mfg. Co., Wheeling, W. Va.
Alexander Bros., Philadelphia, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Browning Mfg. Co., Inc., Maysville, Ky.
General Electric Co., Schenectady, N. Y.
Maysteel Products, Inc., Mayville, Wis.
Remco Products Corp., York, Pa.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Rockwood Mfg. Co., Indianapolis, Ind.

## BASES AND PADS, VIBRATION ISOLATING

● Armstrong Cork Co., Lancaster, Pa.
● Buffalo Forge Co., Buffalo, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Cork Import Corp., New York, N. Y.
Cork Insulation Co., Inc., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Felters Co., Inc., Boston, Mass.
Firestone Tire & Rubber Co., Akron, O.
Gates Rubber Co., Denver, Col.
Goodrich Co., B. F., Akron, O.
Johns-Manville, New York, N. Y.
Keldur Corp., New York, N. Y.
Korfund Co., Long Island City, N. Y.
● Lord Mfg. Co., Erie, Pa.
● Mundet Cork Corp., Brooklyn, N. Y.
National Lead Co., New York, N. Y.
Remco Products Corp., York, Pa.
United Cork Companies, Lyndhurst, N. J.
United States Rubber Co., New York, N. Y.
Vibration Control Co., New York, N. Y.
● Vibration Eliminator Co., Long Island City, N. Y.
Western Felt Works, Chicago, Ill.

## BEARINGS, BALL

Ahlberg Bearing Co., Chicago, Ill.
Bantam Bearings Div., The Torrington Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Burgess-Norton Mfg. Co., Geneva, Ill.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
● Link-Belt Co., Indianapolis, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Nice Ball Bearing Co., Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Philadelphia, Pa.
Schatz Mfg. Co., Fairview, Poughkeepsie, N. Y.
Shafer Bearing Corp., Chicago, Ill.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

## BEARINGS, PILLOW BLOCK

Ahlberg Bearing Co., Chicago, Ill.
Air Controls, Inc., Cleveland, O.
Caldwell Co., W. E., Louisville, Ky.
Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Chain Belt Co., Milwaukee, Wis.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Clizbe Bros. Mfg. Co., Plymouth, Ind.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Freed Products Co., Moline, Ill.
● General Motors Corp., Moraine Products Div., Dayton, O.
Goldens' Foundry & Machine Co., Columbus, Ga.
Hastings Air Conditioning Co., Hastings, Nebr.
Jeffrey Mfg. Co., Columbus, O.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
● Lau Blower Co., Dayton, O.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
● Randall Graphite Products Corp., Chicago, Ill.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
SKF Industries, Inc., Philadelphia, Pa.
Shafer Bearing Corp., Chicago, Ill. (self aligning)
Sprout, Waldron & Co., Muncy, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Triangle Mfg. Co., Oshkosh, Wis.
Viking Air Conditioning Corp., Cleveland, O.
Wood's Sons Co., T. B., Chambersburg, Pa.

## BEARINGS, ROLLER

Ahlberg Bearing Co., Chicago, Ill.
Bantam Bearings Div., The Torrington Co., South Bend, Ind.
Dodge Mfg. Corp., Mishawaka, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Trenton, N. J.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
SKF Industries, Inc., Philadelphia, Pa.
Shafer Bearing Corp., Chicago, Ill. (self aligning)
Timken Roller Bearing Co., Canton, O.
Wood's Sons Co., T. B., Chambersburg, Pa.

## BEARINGS, SLEEVE

Dodge Mfg. Co., Mishawaka, Ind.
Federal-Mogul Corp., Detroit, Mich.

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● General Motors Corp., Moraine Products Div., Dayton, O.
Johnson Bronze Co., New Castle, Pa.
Keystone Carbon Co., Inc., St. Marys, Pa.
Medart Co., St. Louis, Mo.
Motex Metal Process Corp., Detroit, Mich.
● Randall Graphite Products Corp., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

## BELLOWS, THERMOSTATIC

Bishop & Babcock Mfg. Co., Cleveland, O.
Bridgeport Thermostat Co., Inc., Bridgeport, Conn.
Cashin Co., W. D., Boston, Mass.
Chicago Metal Hose Corp., Maywood, Ill.
● Clifford Mfg. Co., Boston, Mass.
Cook Electric Co., Chicago, Ill.
Cryer Trap & Valve Co., Inc., New York, N. Y.
● Fulton Sylphon Co., Knoxville, Tenn.

## BELTING, FLAT, LEATHER

Alexander Bros., Inc., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Chicago Belting Co., Chicago, Ill.
Graton & Knight Co., Worcester, Mass.
Houghton & Co., E. F., Philadelphia, Pa.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Schieren Co., Chas. A., New York, N. Y.
Williams & Son, I. B., Dover, N. H.

## BELTING, FLAT, RUBBER

Boston Woven Hose & Rubber Co., Boston, Mass.
Continental Rubber Wks., Erie, Pa.
Dick Co., Inc., R. & J., Passaic, N. J.
Firestone Tire & Rubber Co., Akron, O.
Garlock Packing Co., Palmyra, N. Y.
Gilmer Co., L. H., Philadelphia, Pa.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Hamilton Rubber Mfg. Co., Trenton, N. J.
Jeffrey Mfg. Co., Columbus, O.
Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
● Manheim Mfg. & Belting Co., Manheim, Pa.
Quaker Rubber Corp., Philadelphia, Pa.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
Rockwood Mfg. Co., Indianapolis, Ind.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
United States Rubber Co., New York, N. Y.

## BELTS, V

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Browning Mfg. Co., Inc., Maysville, Ky.
Chicago Belting Co., Chicago, Ill.
Continental Rubber Wks., Erie, Pa.
Dayton Rubber Mfg. Co., Dayton, O.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Firestone Tire & Rubber Co., Akron, O.
Gates Rubber Co., Denver, Colo.
Gilmer Co., L. H., Philadelphia, Pa.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Graton & Knight Co., Worcester, Mass.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
● Manheim Mfg. & Belting Co., Manheim, Pa.
Medart Co., St. Louis, Mo.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
Rockwood Mfg. Co., Indianapolis, Ind.
Schieren Co., Chas. A., New York, N. Y.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
United States Rubber Co., New York, N. Y.
Wood's Sons Co., T. B., Chambersburg, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

## BENDERS, PIPE

● American Pipe Bending Machine Co., Inc., Boston, Mass.
American Pipe Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Bernz Co., Inc., Otto, Rochester, N. Y.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Crown Die & Tool Co., Chicago, Ill. (Hand)
Greenlee Tool Co., Div. of Greenlee Bros. & Co., Rockford, Ill.
Holsclaw Bros., Inc., Evansville, Ind.
Hossfeld Mfg. Co., Winona, Minn.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
● Pedrick Tool & Machine Co., Philadelphia, Pa.
Pines Engineering Co., Inc., Aurora, Ill.
Shaw-Kendall Engineering Co., Toledo, O.
Tal's Prestal Bender, Inc., Milwaukee, Wis.
Toledo Pipe Threading Machine Co., Toledo, O.
Vanderman Mfg. Co., Willimantic, Conn.
Wallace Supplies Mfg. Co., Chicago, Ill.
Watson-Stillman Co., Roselle, N. J.

## BENDERS, TUBING

● American Pipe Bending Machine Co., Inc., Boston, Mass.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Bernz Co., Inc., Otto, Rochester, N. Y.
● Buffalo Forge Co., Buffalo, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Greenlee Tool Co., Div. of Greenlee Bros. & Co., Rockford, Ill.
Griffith Equipment Co., Inc., Los Angeles, Calif.
Hays Mfg. Co., Erie, Pa. (Copper Tube)
Holsclaw Bros., Inc., Evansville, Ind.
Hossfeld Mfg. Co., Winona, Minn.
Imperial Brass Mfg. Co., Chicago, Ill.
Keeney Mfg. Co., Newington, Conn.
Leonard Precision Products Co., Garden Grove, Calif.
Martin & Sons, H. P., Owensboro, Ky.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Parker Appliance Co., Cleveland, O.
● Pedrick Tool & Machine Co., Philadelphia, Pa.
Perfection Refrigeration Parts Co., Harvey, Ill.
Pines Engineering Co., Inc., Aurora, Ill.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Steel City Electric Co., Pittsburgh, Pa.
Wallace Supplies Mfg. Co., Chicago, Ill.
Watson-Stillman Co., Roselle, N. J.

## BENDS, EXPANSION, STEAM PIPE

American Locomotive Co., Alco Products Div., New York, N. Y.
Chicago Nipple Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
● Flori Pipe Co., The, St. Louis, Mo.
● Grinnell Co., Inc., Providence, R. I.
Harris & Co., Arthur, Chicago, Ill. (Stainless & non-ferrous)
Harrisburg Steel Corp., Harrisburg, Pa.
Kellogg Co., M. W., The, New York, N. Y. (Corrugated steel)
Limbert & Co., Geo. B., Chicago, Ill.
Lumsden & Van Stone Co., South Boston, Mass.
Metal Products Fabricating Co., San Francisco, Calif.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Pipe Bending Co., New Haven, Conn.
National Valve & Mfg. Co., Pittsburgh, Pa.
Ohio Pipe Bending & Machine Co., Cleveland, O.
Parks-Cramer Co., Fitchburg, Mass.
Pittsburgh Pipe Coil & Bending Co., Etna, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
Rempe Co., Chicago, Ill.
● Ric-wiL Co., Cleveland, O.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich
Shaw Co., Benjamin F., Wilmington, Del.
Shaw-Kendall Engineering Co., Toledo, O.
● Walworth Co., New York, N. Y.

## BI-METALS, THERMOSTATIC

Chace Co., W. M., Detroit, Mich.
General Plate Div., Metals & Controls Corp., Attleboro, Mass
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilson Co., H. A., The, Newark, N. J.

## BLACKOUT VENTILATORS

*See Ventilators, Blackout*

## BLADES, PROPELLER FAN

Ackermann Mfg. Co., Wheeling, W. Va.
Aerovent Fan Co., Piqua, O.
Air Controls, Inc., Cleveland, O.
Aire-Foile Fan & Blower Co., Detroit, Mich.
Airmaster Corp., Chicago, Ill.
C & H Air Conditioning Fan Co., Inc., Atlanta, Ga.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Products, Inc., Irvington, N. J.
Circulators & Devices Mfg. Corp., New York, N. Y.
Dallas Engineering Co., Inc., Dallas, Tex.
DeBothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Dual Air Fan Co., Chicago, Ill.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
International Engrg., Inc., Dayton, O.
Jeffrey Mfg. Co., Columbus, O.
● La-Del Conveyor & Mfg. Co., New Philadelphia, O.
Meier Electric & Machine Co., Indianapolis, Ind.
Myers Electric Co., Inc., Pittsburgh, Pa.
Norwin Co., Freeport, Ill.
● Peerless Electric Co., Warren, O.
Propellair, Inc., Springfield, O.
Schwitzer-Cummins Co., Indianapolis, Ind.
South Bend Air Products Corp., South Bend, Ind.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Industries, Indio, Calif.
Torrington Mfg. Co., Torrington, Conn.

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Utility Appliance Corp., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.

## BLAST GATES

*See Gates, Blast*

## BLAST HEATERS

*See Surface, Heating*

## BLAST HEATING COILS

*See Surface, Heating*

## BLOW PIPE FITTINGS

*See Fittings, Blow Pipe*

## BLOWER FANS

*See Fans, Centrifugal*

## BLOWER HOUSINGS

*See Housings, Fan, Centrifugal*

## BLOWER WHEELS

*See Wheels, Blower*

## BLOWERS, HIGH PRESSURE

*For Low Pressure Blower Fans, See Fans, Centrifugal*

Aladdin Heating Corp., Oakland, Calif.
Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Corp., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Beach-Russ Co., New York, N. Y.
● Buffalo Forge Co., Buffalo, N. Y.
● Caldwell Co., Wm. J., Washington, D. C.
Carling Turbine Blower Co., Worcester, Mass.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Circulators & Devices Mfg. Corp., New York, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
De Laval Steam Turbine Co., Trenton, N. J.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Eclipse Fuel Engineering Co., Rockford, Ill.
Garden City Fan Co., Chicago, Ill.
● Ingersoll-Rand Co., New York, N. Y.
L-R Mfg. Co., Blower Div., Torrington, Conn.
Lammert & Mann Co., Chicago, Ill.
Muncie Gear Wks., Muncie, Ind.
National Machine Gas Burners, Div. of Mid-Continent Metal Products Co., Chicago, Ill.
National Machine Works, Chicago, Ill.
North American Mfg. Co., Cleveland, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trimount Rotary Power Co., East Bedham, Mass.
Utility Appliance Corp., Los Angeles, Calif.
Western Blower Co., Seattle, Wash.
● Wing Mfg. Co., L. J., New York, N. Y.

## BLOWERS, SOOT

Bayer Co., St. Louis, Mo.
Diamond Power Specialty Corp., Detroit, Mich.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Perfection Grate & Stoker Co., Springfield, Mass.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.

## BLOW-OFF VALVES

*See Valves, Blow-off*

## BLUE PRINT MACHINES

*See Machines, Blue Print and White Print*

## BOILER CLEANING COMPOUNDS

*See Compounds, Boiler Cleaning*

## BOILER FEED PUMPS

*See Pumps, Boiler Feed*

## BOILER FEEDERS

*See Feeders, Water, Heating Boiler*

## BOILER OBSERVATION PORTS

*See Ports, Observation, Boiler*

## BOILER SEALING COMPOUNDS

*See Compounds, Boiler and Radiator Sealing*

## BOILER AND TANK INSULATION

*See Insulation, Boiler and Tank*

## BOILER TUBES

*See Tubes, Boiler*

## BOILER WATER ALARMS

*See Alarms, High and Low Boiler Water*

## BOILERS, HEATING, CAST IRON, SECTIONAL

*2000 Sq Ft Steam Radiation and Over*

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
Bastian-Morley Co., Inc., La Porte, Ind.
Bryan Steam Corp., Peru, Ind.
● Bryant Heater Co., The, Cleveland, O.
Burnham Boiler Corp., Irvington, N. Y.
Columbia Radiator Co., McKeesport, Pa.
● Crane Co., Chicago, Ill.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
Herbert Boiler Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kohler Co., Kohler, Wis.
National Radiator Co., The, Johnstown, Pa.
● Prox Co., Inc., Frank, Terre Haute, Ind.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Thatcher Furnace Co., Garwood, N. J.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

## BOILERS, HEATING, STEEL, FIRE TUBE

*2000 Sq Ft Steam Radiation and Over*

Ames Iron Wks., Div. of Pierce Butler Radiator Corp., Oswego, N. Y.
Atlantic Steel Boiler Co., Philadelphia, Pa.
Bigelow Co., New Haven, Conn.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
Burnham Boiler Corp., Irvington, N. Y.
Cleaver-Brooks Co., Milwaukee, Wis.
Combination Boiler Co., Benton Harbor, Mich.
Combustion Engineering Co., Inc., New York, N. Y.
Dillon Steam Boiler Wks., Inc., D. M., Fitchburg, Mass.
Erie City Iron Wks., Erie, Pa.
Farrar & Trefts, Buffalo, N. Y.
● Fitzgibbons Boiler Co., Inc., New York, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Gallaher Boiler Co., St. Louis, Mo.
General Furnaces Corp., New York, N. Y.
Hodge Boiler Wks., East Boston, Mass.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Inc., Framingham, Mass.
Johnston Bros., Inc., Ferrysburg, Mich.
Keeler Co., Williamsport, Pa.
● Kewanee Boiler Corp., Kewanee, Ill.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Leffel & Co., Springfield, O.
Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
Manitowoc Boiler Wks., Manitowoc, Wis.
Murray Iron Wks. Co., Burlington, Ia.
National Radiator Co., The, Johnstown, Pa.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boiler Div., United States Radiator Corp., Detroit, Mich.
Smith Twin Tubular Boiler Co., Inc., Philadelphia, Pa.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Titusville Iron Wks. Co., Titusville, Pa.
Union Iron Wks., Erie, Pa.
Vortex Mfg. Co., Portland, Ore.
Wickes Boiler Co., Saginaw, Mich.

## BOILERS, HEATING, STEEL, WATER TUBE

Anetsberger Bros., Chicago, Ill.
Atlantic Steel Boiler Co., Philadelphia, Pa.
Babcock & Wilcox Co., New York, N. Y.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
Combustion Engineering Co., Inc., New York, N. Y.
Edge Moor Iron Wks., Inc., New York, N. Y.
Erie City Iron Wks., Erie, Pa.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Inc., Framingham, Mass.
Keeler Co., E., Williamsport, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
Murray Iron Wks. Co., Burlington, Ia.
Orr & Sembower, Inc., Reading, Pa.
Riley Stoker Corp., Worcester, Mass.
Smith Twin Tubular Boiler Co., Inc., Philadelphia, Pa.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Super Mold Corp., Lodi, Calif.
Titusville Iron Wks. Co., Titusville, Pa.
Union Iron Works, Erie, Pa.
Vapor Car Heating Co., Inc., Chicago, Ill.
Waterfilm Boilers, Inc., Jersey City, N. J.
Wickes Boiler Co., Saginaw, Mich.

## BOILERS, STEAM GENERATING UNITS, HEATING AND PROCESS

Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Clayton Mfg. Co., Alhambra, Calif.
Cleaver-Brooks Co., Milwaukee, Wis.
Eclipse Fuel Engineering Co., Rockford, Ill.
Erie City Iron Works, Erie, Pa.
● Fitzgibbons Boiler Co., Inc., New York, N. Y.
General Furnaces Corp., New York, N. Y.
Hodge Boiler Works, East Boston, Mass.
International Boiler Works Co., East Stroudsburg, Pa
Johnson Co., S. T., Oakland, Calif.
Johnston Bros., Inc., Ferrysburg, Mich.
Leffel & Co., James, Springfield, O.
Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Murray Iron Works Co., Burlington, Ia.
Orr & Sembower, Inc., Reading, Pa.
Preferred Utilities Mfg. Corp., New York, N. Y.

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Riley Stoker Corp., Worcester, Mass.
Sellers Engineering Co., Chicago, Ill.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Stout & Sons, David, St. Louis, Mo.
Thermal Engineering Co., Chicago, Ill.
Vapor Car Heating Co., Inc., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.
Wickes Boiler Co., Saginaw, Mich.

### BOLTS, EXPANSION

Chase Brass & Copper Co., Waterbury, Conn.
Chicago Expansion Bolt Co., Chicago, Ill.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
National Lead Co., New York, N. Y.
Paine Co., Chicago, Ill.
Rawlplug Co., Inc., The, New York, N. Y.
Rolyan Metal Products, Chicago, Ill.
Star Expansion Bolt Co., New York, N. Y.
U. S. Expansion Bolt Co., York, Pa.

### BOLTS AND STUDS, FLANGE

Bethlehem Steel Co., Bethlehem, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Buffalo Bolt Co., North Tonawanda, N. Y.
Carpenter & Paterson, Inc., East Boston, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Bros. Bolt Co., Milldale, Conn.
● Crane Co., Chicago, Ill.
Erie Bolt & Nut Co., Erie, Pa.
Haskell Mfg. Co., Wm. H., Pawtucket, R. I.
Lamson & Sessions Co., Cleveland, O.
Maintenance Engineering Corp., Houston, Tex.
Republic Steel Corp., Bolt & Nut Div., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

### BOLTS, TOGGLE AND ANCHOR

Carpenter & Paterson, Inc., East Boston, Mass.
Carty & Moore Engineering Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Expansion Bolt Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
Grabler Mfg. Co., Cleveland, O.
Paine Co., Chicago, Ill.
Rawlplug Co., Inc., The, New York, N. Y.
Republic Steel Corp., Bolt & Nut Div., Cleveland, O.
Star Expansion Bolt Co., New York, N. Y.
U. S. Expansion Bolt Co., York, Pa.

### BOOTHS, PAINTING, SPRAY

Aqua-Restor Div., Mayer Mfg. Corp., Brooklyn, N. Y.
Binks Mfg. Co., Chicago, Ill.
DeVilbiss Co., The, Toledo, O.
Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
Mahon Co., R. C., Detroit, Mich.
Peters-Dalton, Inc., Detroit, Mich.
Schmieg Industries, Detroit, Mich.
Spray Engineering Co., Somerville, Mass.
Young & Bertke Co., Cincinnati, O.

### BRAKES, SHEET METAL, HAND

Dreis & Krump Mfg. Co., Chicago, Ill.
Eiker Mfg. Co., Ogallala, Nebr.
Excelsior Tool & Machine Co., East St. Louis, Ill.
New Albany Machine Mfg. Co., New Albany, Ind.
Niagara Machine & Tool Works, Buffalo, N. Y.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
St. Louis Tool Co., St. Louis, Mo.
Weiss & Co., H., New York, N. Y.
Whitney Metal Tool Co., Rockford, Ill.

### BRAKES, SHEET METAL, PORTABLE

Dreis & Krump Mfg. Co., Chicago, Ill.
Eiker Mfg. Co., Ogallala, Nebr.
Harris, A. R., Hammond, Ind.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Whitney Metal Tool Co., Rockford, Ill.

### BRAKES, SHEET METAL, POWER

Bath Co., Cyril J., The, Cleveland, O.
Cincinnati Shaper Co., Cincinnati, O.
Dreis & Krump Mfg. Co., Chicago, Ill.
Heartley Machine & Tool Co., Toledo, O.
Ohl & Co., Geo. A., Newark, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Rafter Machine Co., Belleville, N. J.
Swaine Mfg. Co., Fred J., St. Louis, Mo.
Verson Allsteel Press Co., Chicago, Ill.
Weiss & Co., H., New York, N. Y.
Whitney Metal Tool Co., Rockford, Ill.

### BRASS PIPE

*See Pipe, Brass and Copper*

### BRASS TUBING

*See Tubing, Brass and Copper*

### BRASS UNIONS

*See Unions, Brass*

### BRASS VALVES

*See Valves, Gate; and Valves, Globe*

### BRAZING TORCHES

*See Torches, Brazing*

### BRONZE VALVES

*See Valves, Gate; and Valves, Globe*

### BUILDING INSULATION

*See Insulation, Building*

### BURNERS, GAS, COMMERCIAL AND INDUSTRIAL

Barber Gas Burner Co., Cleveland, O.
Beck Engineering Combustion Kompany, St. Louis, Mo.
● Bryant Heater Co., The, Cleveland, O.
Campbell Heating Co., E. K., Kansas City, Mo.
Conco Engineering Works, Div. of H. D. Conkey Co., Mendota, Ill.
Coppus Engineering Corp., Worcester, Mass.
Eclipse Fuel Engrg. Co., Rockford, Ill.
Engineer Co., New York, N. Y.
Enterprise Engine & Foundry Co., San Francisco, Calif.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Jamieson Mfg. Co., Dallas, Tex.
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Martin, J. O. & C. U., San Francisco, Calif.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
● Mettler Co., Lee B., Los Angeles, Calif.
National Airoil Burner Co., Inc., Philadelphia, Pa.
National Machine Gas Burners, Div. of Mid-Continent Metal Products Co., Chicago, Ill.
North American Mfg. Co., Cleveland, O.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
Peabody Engrg. Corp., New York, N. Y.
R-S Products Corp., Philadelphia, Pa.
Ray Oil Burner Co., San Francisco, Calif.
Roberts-Gordon Appliance Corp., Buffalo, N. Y.
Ross Engineering Corp., J. O., New York, N. Y.
Rotary Mfg. Co., Los Angeles, Calif.
Schutte & Koerting Co., Philadelphia, Pa.
Selas Corp. of America, Philadelphia, Pa.
Sellers Engineering Co., Chicago, Ill.
Sonner Burner Co., Winfield, Kans.
Staples & Pfeiffer, San Francisco, Calif.
Stout & Sons, David, St. Louis, Mo.
● Sullivan Valve & Engineering Co., Butte, Mont.
● Surface Combustion, Toledo, O.
● Todd Shipyards Corp., Combustion Equipment Div., New York, N. Y.
● Webster Engineering Co., Tulsa, Okla.
Williams, Inc., F. C., Dearborn, Mich.
● Zink Co., John, Tulsa, Okla.

### BURNERS, GAS AND OIL COMBINED, COMMERCIAL AND INDUSTRIAL

Babcock & Wilcox Co., New York, N. Y.
Coppus Engineering Corp., Worcester, Mass.
Engineer Co., New York, N. Y.
Enterprise Engine & Foundry Co., San Francisco, Calif.
Johnson Co., S. T., Oakland, Calif.
Lammert & Mann Co., Chicago, Ill.
● Mettler Co., Lee B., Los Angeles, Calif.
National Airoil Burner Co., Inc., Philadelphia, Pa.
Peabody Engineering Corp., New York, N. Y.
R-S Products Corp., Philadelphia, Pa.
Ray Oil Burner Co., San Francisco, Calif.
Ross Engineering Corp., J. O., New York, N. Y.
Sellers Engineering Co., Chicago, Ill.
Staples & Pfeiffer, San Francisco, Calif.
● Surface Combustion, Toledo, O.
Thermal Engineering Co., Chicago, Ill.
● Todd Shipyards Corp., Combustion Equipment Div., New York, N. Y.
● Webster Engineering Co., Tulsa, Okla.
● Zink Co., John, Tulsa, Okla.

### BURNERS, OIL, COMMERCIAL AND INDUSTRIAL

● Airtemp, Div. of Chrysler Corp., Dayton, O.
Babcock & Wilcox Co., New York, N. Y.
Bethlehem Foundry & Machine Co., Bethlehem, Pa.
Caloroil Burner Corp., Hartford, Conn.
Century Engrg. Corp., Cedar Rapids, Ia.
Chandler Co., Cedar Rapids, Ia.
Chisholm Co., Allen E., Portland, Ore.
Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
Coppus Engineering Corp., Worcester, Mass.
Eastern Oil & Equipment Co., Inc., Portland, Me.
Electrol Mfg. Co., Passaic, N. J.
Engineering Co., New York, N. Y.
Enterprise Engine & Foundry Co., San Francisco, Calif.
Gilbert & Barker Mfg. Co., West Springfield, Mass.
Hardinge Mfg. & Oil Burner Co., Chicago, Ill.
Harvey-Whipple, Inc., Springfield, Mass.
Holtum Mfg. Co., Freeport, Ill.
Johnson Co., S. T., Oakland, Calif.
Kleen-Heet, Inc., Chicago, Ill.

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Lammert & Mann Co., Chicago, Ill.
Littleford Bros., Cincinnati, O.
Malleable Iron Fittings Co., Branford, Conn.
● May Oil Burner Corp., Baltimore, Md.
● Mettler Co., Lee B., Los Angeles, Calif.
Montag Stove & Furnace Works, Portland, Ore.
National Airoil Burner Co., Inc., Philadelphia, Pa.
North American Mfg. Co., Cleveland, O.
Nu-Way Corp., Rock Island, Ill.
Pan-American Engineering Co., Berkeley, Calif.
Peabody Engrg. Corp., New York, N. Y.
● Petroleum Heat & Power Co., Stamford, Conn.
Preferred Utilities Mfg. Corp., New York, N. Y.
Quiet Heet Mfg. Co., Newark, N. J.
R-S Products Corp., Philadelphia, Pa.
Ray Oil Burner Co., San Francisco, Calif.
Rayfield Co., C. L., Chicago, Ill.
Reif-Rexoil, Inc., Buffalo, N. Y.
Riley Stoker Corp., Worcester, Mass.
Ross Engineering Corp., J. O., New York, N. Y.
Rotary Mfg. Co., Los Angeles, Calif.
Schutte & Koerting Co., Philadelphia, Pa.
Scott-Newcomb, Inc., St. Louis, Mo.
Simplex Oil Heating Corp., Newark, N. J.
Staples & Pfeiffer, San Francisco, Calif.
Thermal Engineering Co., Chicago, Ill.
● Todd Shipyards Corp., Combustion Equipment Div., Brooklyn, N. Y.
Vortex Mfg. Co., Portland, Ore.
Wayne Oil Burner Co., Fort Wayne, Ind.
● Webster Engineering Co., Tulsa, Okla.
Williams, Inc., F. C., Dearborn, Mich.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
York-Heat Div., York-Shipley, Inc., York, Pa.
● Zink Co., John, Tulsa, Okla.

## BURNERS, PULVERIZED COAL, COMMERCIAL AND INDUSTRIAL

Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., Inc., New York, N. Y.
Peabody Engineering Corp., New York, N. Y.
Riley Stoker Corp., Worcester, Mass.
Whiting Corp., Harvey, Ill.

## BURNERS, PULVERIZED COAL AND GAS, COMBINED, COMMERCIAL AND INDUSTRIAL

Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., Inc., New York, N. Y.
Peabody Engineering Corp., New York, N. Y.
Riley Stoker Corp., Worcester, Mass.

## BURNERS, PULVERIZED COAL AND OIL, COMBINED, COMMERCIAL AND INDUSTRIAL

Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., Inc., New York, N. Y.
Engineer Co., New York, N. Y.
Peabody Engineering Corp., New York, N. Y.
Riley Stoker Corp., Worcester, Mass.

## CARBON DIOXIDE ANALYZERS

*See Analyzers, Carbon Dioxide, Portable*

## CARBON DIOXIDE INDICATORS

*See Indicators, Carbon Dioxide, Boiler Room*

## CARBON PIPE, TUBING, FITTINGS AND VALVES

*See Pipe, Tubing, Fittings and Valves, Carbon*

## CAST IRON PIPE

*See Pipe, Cast Iron*

## CEMENT AND COMPOUNDS, PIPE JOINT

Acme Refining Co., The, Cleveland, O.
Acorn Refining Co., Cleveland, O.
Akron Metallic Gasket Co., Akron, O.
Atlas Chemical Co., Marietta, O.
Babbitt Industrial Specialties Co., New York, N. Y.
Baer Bros., New York, N. Y.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Black Magic Products Co., Tulsa, Okla.
Blue Seal Chemical Co., Roselle Park, N. J.
Calbar Paint & Varnish Co., Philadelphia, Pa.
Clinton Metallic Paint Co., Clinton, N. Y.
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Continental Products Co., Euclid, O.
Cooper Sanitary Co., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Crane Packing Co., Chicago, Ill.
Croll & Son, Jesse G., Philadelphia, Pa.
Detroit Graphite Co., Detroit, Mich.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Greene, Tweed & Co., New York, N. Y.
● Grinnell Co., Inc., Providence, R. I.
Hercules Chemical Co., Inc., New York, N. Y.
Hetzel Roofing Products Co., Newark, N. J.
Horn Co., A. C., Long Island City, N. Y.
● Key Co., East St. Louis, Ill.
Keystone Asphalt Products Co., Chicago, Ill.
Krehbiel Co., J. H., Chicago, Ill.
Mackson's Co., New York, N. Y.
Metropolitan Refining Co., Inc., Long Island City, N. Y.
Montgomery Bros., San Francisco, Calif.
National Engineering Products, Inc., Washington, D. C.
Nebel Mfg. Co., Cleveland, O.
Pecora Paint Co., Inc., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Permatex Co., Inc., Brooklyn, N. Y.
Preferred Utilities Mfg. Corp., New York, N. Y.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Radiator Specialty Co., Charlotte, N. C.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Rockwood Sprinkler Co., Worcester, Mass.
● Rutland Fire Clay Co., Rutland, Vt.
Sauereisen Cements Co., Pittsburgh, Pa.
Schundler & Co., F. E., Long Island City, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J.
Star Products Co., New York, N. Y.
Thompson & Co., Pittsburgh, Pa.
United States Stoneware Co., New York, N. Y.
Utility Laboratory, Inc., Brooklyn, N. Y.
Wilhelm Co., A., Reading, Pa.
● X Laboratories, Inc., New York, N. Y.
X-Pando Corp., Long Island City, N. Y.

## CEMENT, FURNACE

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Armstrong Co., Detroit, Mich.
Botfield Refractories Co., Philadelphia, Pa.
Buckeye Products Co., Cincinnati, O.
Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Chicago Fire Brick Co., Chicago, Ill.
Clinton Metallic Paint Co., Clinton, N. Y. (Asbestos)
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Continental Products Co., Euclid, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Fireline Stove & Furnace Lining Co., Chicago, Ill.
Glidden Co., Cleveland, O.
● Grant Wilson, Inc., Chicago, Ill. (Asbestos)
Green Fire Brick Co., A. P., Mexico, Mo.
Hercules Chemical Co., Inc., New York, N. Y.
Hetzel Roofing Products Co., Newark, N. J.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y. (Asbestos)
Klee Co., Geo. B., Cincinnati, O.
Krehbiel Co., J. H., Chicago, Ill.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Lastik Products Co., Inc., Pittsburgh, Pa.
McLeod & Henry Co., Inc., Troy, N. Y.
Munn and Steel, Inc., Newark, N. J.
Nebel Mfg. Co., Cleveland, O.
Pecora Paint Co., Philadelphia, Pa.
Plastic Products Co., Detroit, Mich.
Preferred Utilities Mfg. Corp., New York, N. Y.
Presstite Engineering Co., St. Louis, Mo.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y.
Ruberoid Co., New York, N. Y.
● Rutland Fire Clay Co., Rutland, Vt.
Sall Mountain Co., Chicago, Ill.
Sauereisen Cements Co., Pittsburgh, Pa.
Standard Asbestos Mfg. Co., Chicago, Ill.
Standard Fuel Engineering Co., Detroit, Mich.
Tamms Silica Co., Chicago, Ill.
Taylor Sons Co., Charles, Cincinnati, O.
United States Stoneware Co., New York, N. Y.
Walsh Refractories Corp., St. Louis, Mo.
Wilhelm Co., A., Reading, Pa.
● Wilson, Grant, Inc., Chicago, Ill. (Asbestos)

## CEMENT, INSULATING

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Alton Mineral Wool Insulation Co., Alton, Ill.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Bird-Archer Co., Philadelphia, Pa.
Botfield Refractories Co., Philadelphia, Pa.
Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Carney Rockwool Co., Mankato, Minn.
Chicago Fire Brick Co., Chicago, Ill.
Clinton Metallic Paint Co., Clinton, N. Y.
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Eimer & Amend, New York, N. Y.
● Grant Wilson, Inc., Chicago, Ill.
Green Fire Brick Co., A. P., Mexico, Mo.
Industrial Research, Lansdowne, Pa.
International Vermiculite Co., Girard, Ill.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Krehbiel Co., J. H., Chicago, Ill. (Asbestos, mineral wool)
McLeod & Henry Co., Inc., Troy, N. Y.
Mitchell & Smith, Inc., Detroit, Mich.
Munn and Steele, Inc., Newark, N. J.
National Engineering Products, Inc., Washington, D. C.

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- National Gypsum Co., Buffalo, N. Y.
- Nelson Mfg. Co., B. F., Minneapolis, Minn.
- Norristown Magnesia & Asbestos Co., Norristown, Pa.
- Ohmlac Paint & Refining Co., Chicago, Ill.
- ● Owens-Corning Fiberglas Corp., Toledo, O.
- Plant Rubber & Asbestos Works, San Francisco, Calif.
- Plibrico Jointless Firebrick Co., Chicago, Ill.
- Poe Co., C. W., Cleveland, O.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Pyrolite Products Co., Cleveland, O.
- Quigley Co., Inc., New York, N. Y.
- Ramtite Co., The, Chicago, Ill.
- Refractory & Insulation Corp., New York, N. Y.
- Rex Clay Products Co., Detroit, Mich.
- Robinson Insulation Co., Great Falls, Mont.
- Rock Fleece Co., El Paso, Tex.
- Ruberoid Co., New York, N. Y.
- ● Rutland Fire Clay Co., Rutland, Vt.
- Sall Mountain Co., Chicago, Ill.
- Sauereisen Cements Co., Pittsburgh, Pa. (Electrical)
- Schundler & Co., Inc., F. E., Long Island City, N. Y.
- Smith & Kanzler Corp., Elizabeth, N. J.
- Standard Asbestos Mfg. Co., Chicago, Ill.
- Standard Fuel Engineering Co., Detroit, Mich.
- Tennessee Products Corp., Nashville, Tenn.
- Therminsul Corp., Kalamazoo, Mich.
- Thompson & Co., Pittsburgh, Pa.
- United States Mineral Wool Co., Chicago, Ill.
- Universal Zonolite Insulation Co., Chicago, Ill.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- ● Wilson, Inc., Grant, Chicago, Ill.

## CENTRIFUGAL PUMPS

*See Pumps, Centrifugal*

## CHAIN DRIVES

*See Drives, Chain*

## CHAMBERS, TEST, CONTROLLED TEMPERATURE AND HUMIDITY

- American Coils, Inc., Newark, N. J.
- Atlas Electric Devices Co., Chicago, Ill.

## CHANGERS, SPEED, HYDRAULIC COUPLING

- American Blower Corp., Detroit, Mich.

## CHANGERS, SPEED, MECHANICAL

- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- American Pulley Co., Philadelphia, Pa.
- Browning Mfg. Co., Inc., Maysville, Ky.
- Doall Co., The, Des Plaines, Ill.
- Dodge Mfg. Corp., Mishawaka, Ind.
- Graham Transmissions, Inc., Milwaukee, Wis.
- Ideal Commutator Dresser Co., Sycamore, Ill.
- Lewellen Mfg. Co., Columbus, Ind.
- ● Link-Belt Co., Philadelphia, Pa.
- Reeves Pulley Co., Columbus, Ind.
- Standard Transmission Equipment Co., Los Angeles, Calif.
- ● Stephens-Adamson Mfg. Co., Aurora, Ill.
- White Mfg. Co., St. Paul, Minn.

## CHECK VALVES

*See Valves, Check*

## CHILLERS, WATER, FOR AIR CONDITIONING AND REFRIGERATION

- ● Acme Industries, Inc., Jackson, Mich.
- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- Croll-Reynolds Engineering Co., Inc., New York, N. Y.
- ● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
- Davis Engineering Corp., Elizabeth, N. J.
- Downingtown Iron Works, Downingtown, Pa.
- ● Drayer & Hanson, Inc., Los Angeles, Calif.
- Filtrine Mfg. Co., Brooklyn, N. Y.
- Frick Co., Waynesboro, Pa.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Griscom-Russell Co., The, New York, N. Y.
- Heat Transfer Products, Inc., New York, N. Y.
- Howe Ice Machine Co., Chicago, Ill.
- Larkin Coils, Inc., Atlanta, Ga.
- McQuay, Inc., Minneapolis, Minn.
- Niagara Blower Co., New York, N. Y.
- Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Phillips Cooling Tower Co., Inc., New York, N. Y.
- Refrigeration Economics Co., Inc., Canton, O.
- Richmond Engineering Co., Inc., Richmond, Va.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Sims Co., Erie, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Temprite Products Corp., Detroit, Mich.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Whitlock Mfg. Co., Hartford, Conn.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigerating Co., Chicago, Ill.
- ● York Corp., York, Pa.

## CIRCULATORS FOR HOT WATER HEATING SYSTEMS

- American-Marsh Pumps, Inc., Battle Creek, Mich.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Columbus Steam Pump Works Co., Columbus, O.
- Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- Hotstream Heater Co., Cleveland, O.
- Kainer & Co., Chicago, Ill.
- Kehm Corp., The, Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Penberthy Injector Co., Detroit, Mich.
- Taco Heaters, Inc., New York, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Trane Co., The, La Crosse, Wis.
- Triplex Heating Specialty Co., Peru, Ind.
- White Flo-Matic Corp., Hoosick Falls, N. Y.

## CLAMPS, BEAM, PIPE HANGING

- Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
- Carpenter & Paterson, Inc., East Boston, Mass.
- Chicago Nipple Mfg. Co., Chicago, Ill.
- ● Crane Co., Chicago, Ill.
- Crawford Co., Chicago, Ill.
- Diamond Expansion Bolt Co., Inc., Garwood, N. J.
- Farley Sleeve & Hanger Co., Cleveland, O.
- Fee & Mason Mfg. Co., Inc., New York, N. Y.
- ● Flori Pipe Co., The, St. Louis, Mo.
- Frick Co., Waynesboro, Pa.
- Globe Machine & Stamping Co., Div. of Hupp Motor Car Corp., Cleveland, O.
- Grabler Mfg. Co., Cleveland, O.
- ● Grinnell Co., Inc., Providence, R. I.
- Jarecki Mfg. Co., Erie, Pa.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Paine Co., Chicago, Ill.
- ● Walworth Co., New York, N. Y.

## CLAMPS, PIPE REPAIR

- Alten's Foundry & Machine Works, Lancaster, O.
- Chelsea Metal Stamping Co., New York, N. Y.
- Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
- Inner-Tite Clamp Corp., Elizabeth, N. J.
- Jarecki Mfg. Co., Erie, Pa.
- Skinner Co., M. B., South Bend, Ind.
- Smooth-On Mfg. Co., Jersey City, N. J.
- ● Yarnall-Waring Co., Philadelphia, Pa.

## CLAMPS, PIPE, WELDING

- ● Detroit Stamping Co., Detroit, Mich.
- Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
- Jewel Mfg. Co., St. Paul, Minn.
- Williams & Co., J. H., Buffalo, N. Y.

## CLEANERS, AIR, ELECTRICAL

- ● American Air Filter Co., Inc., Louisville, Ky.
- ● Westinghouse Electric & Mfg. Co., Cleveland, O.

## CLEANERS, TUBE

- Albright Equipment Co., Johnstown, Pa.
- Armstrong Mfg. Co., Bridgeport, Conn.
- Elliott Co., Jeannette, Pa.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Mall Tool Co., Chicago, Ill.
- Osborn Mfg. Co., Cleveland, O.
- Perfection Grate & Stoker Co., Springfield, Mass.
- Pierce Co., Wm. B., The, Buffalo, N. Y.
- Pilley Brush Co., Fort Madison, Ia.
- Rosedale Foundry & Machine Co., Pittsburgh, Pa
- Spencer Turbine Co., Hartford, Conn.
- Stow Mfg. Co., Binghampton, N. Y.
- Wallace & Tiernan Co., Inc., Newark, N. J. (for slime and scale)

## CLEANING COMPOUNDS

*See Compounds, Cleaning, Pipe Coil and Condenser*

## COAL BURNERS

*See Burners, Pulverized Coal; Stokers*

## COAL CONVEYORS

*See Conveyors, Coal and Ash*

## COATINGS, PROTECTIVE, FOR METALS

- Alrose Chemical Co., Providence, R. I.
- Amercoat Div., American Pipe & Construction Co., Los Angeles, Calif.
- American Solder & Flux Co., Philadelphia, Pa. (Galvanizing powder)
- Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
- Blue Ridge Talc Co., Inc., Henry, Va.
- Bonafide Genasco, Inc., New York, N. Y.
- Cordo Chemical Co., Norwalk, Conn.
- Dampney Co. of America, Boston, Mass.
- Dearborn Chemical Co., Chicago, Ill. (rust preventive)
- Debevoise Co., The, Brooklyn, N. Y. (cement)
- Flintkote Co., The, New York, N. Y. (Asphalt emulsions)
- Galv-Weld Products, Dayton, O.
- Goodrich Co., B. F., Akron, O.

● Advertisement in this issue. See Index to Advertisers, page 350.

Haering Co., Inc., D. W., Chicago, Ill. (drying and non-drying)
Johnson Co., Lloyd S., Chicago, Ill.
Laclede-Christy Clay Products Co., St. Louis, Mo. (high temperature paint)
Lastik Products Co., Inc., Pittsburgh, Pa.
● Mortell Co., J. W., Kankakee, Ill. (asphalt)
National Lead Co., New York, N. Y. (red lead)
Nebel Mfg. Co., Cleveland, O.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
Ohmlac Paint & Refining Co., Chicago, Ill. (acid resistant, heat resistant)
● Penn Galvanizing Co., Philadelphia, Pa. (Galvanizing)
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Protective Coatings, Inc., Detroit, Mich.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Reilly Tar & Chemical Corp., Indianapolis, Ind. (coal tar base)
● Ric-wiL Co., Cleveland, O.
Saverite Engineering Co., Hoboken, N. J.
Socony Paint Products, Div. of Socony-Vacuum Oil Co., Inc., New York, N. Y.
Sonneborn Sons, Inc., L., New York, N. Y.
Turco Products, Inc., Los Angeles, Calif.
United Chromium, Inc., New York, N. Y.
United States Stoneware Co., New York, N. Y. (Corrosion resistant)
Vesco Corp., New York, N. Y.
Wailes Dove-Hermiston Corp., Westfield, N. J. (coal tar industrial pigmented)
Wilbur & Williams Co., Boston, Mass.
Wipe-On Corp., New York, N. Y.
Wolfe-Kote Co., Sheboygan, Wis.
X-Pando Corp., Long Island City, N. Y.

## COCKS, BOILER GAGE

American Injector Co., Detroit, Mich.
Bordo Co., Inc., L. J., Glenside, Pa.
● Crane Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Hanlon-Waters, Tulsa, Okla.
Keckley Co., O. C., Chicago, Ill.
Lunkenheimer Co., Cincinnati, O.
Reliance Gauge Column Co., Cleveland, O.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

## COILS

*See Surface, Cooling; Surface, Heating*

## COILS, FOR HOT WATER STORAGE TANKS

● American District Steam Co., North Tonawanda, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Davis Engineering Corp., Elizabeth, N. J.
Downingtown Iron Works, Downingtown, Pa.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
Kopperman & Sons, Joseph, Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Taco Heaters, Inc., New York, N. Y.
● Trane Co., The, La Crosse, Wis.
● Whitlock Mfg. Co., Hartford, Conn.

## COILS, PIPE

● Acme Industries, Inc., Jackson, Mich.
American Smelting & Refining Co., New York, N. Y.
● Baker Ice Machine Co., Inc., Omaha, Nebr.
Beacon-Morris Corp., Boston, Mass.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Harris & Co., Arthur, Chicago, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Limbert & Co., Geo. B., Chicago, Ill.
● Marlo Coil Co., St. Louis, Mo.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
● Mueller Brass Co., Port Huron, Mich.
National Pipe Bending Co., New Haven, Conn.
Ohio Pipe Bending & Machine Co., Cleveland, O.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Co., Chicago, Ill.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
● Whitlock Mfg. Co., Hartford, Conn.

## COLLECTORS, DUST

Aget-Detroit Co., Ann Arbor, Mich.
Allen Billmyre Co., Mamaroneck, N. Y.
Allington & Curtis Mfg. Co., Saginaw, Mich.
● American Air Filter Co., Louisville, Ky.
American Blower Corp., Detroit, Mich.
American Foundry Equipment Co., Mishawaka, Ind.
American Metal Products Co., Fort Worth, Tex.
Aqua-Restor Div., Mayer Mfg. Corp., Brooklyn, N. Y.
Bargar Sheet Metal Co., Cleveland, O.
Bayley Blower Co., Milwaukee, Wis.
Blower Application Co., Milwaukee, Wis.
Bubar, Hudson H., New York, N. Y.
● Buffalo Forge Co., Buffalo, N. Y.
Buffalo Tank Corp., Dunellen, N. J.
Centri-Spray Co., Detroit, Mich.
Clark Dust Control Co., Chicago, Ill.
Day Co., The, Minneapolis, Minn.
Diamond Power Specialty Corp., Detroit, Mich.
Dracco Corp., Cleveland, O.
Garden City Fan Co., Chicago, Ill.
Goethel Sheet Metal Wks., Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Jacobs Co., B. & J., Cincinnati, O.
Kirk & Blum Mfg. Co., Cincinnati, O.
Kluegel & Co., E., St. Paul, Minn.
Knickerbocker Co., Jackson, Mich.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Lumm Co., A. H., Toledo, O.
Northern Blower Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Peters-Dalton, Inc., Detroit, Mich.
Prat-Daniel Corp., Port Chester, N. Y.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Research Corp., New York, N. Y.
Ruemelin Mfg. Co., Milwaukee, Wis.
Schmieg Industries, Detroit, Mich.
Schneible Co., Claude B., Detroit, Mich.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Sly Mfg. Co., W. W., Cleveland, O.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Spencer Turbine Co., Hartford, Conn.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
Strandwitz & Co., Inc., W. J., Camden, N. J.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Torit Mfg. Co., St. Paul, Minn.
Western Blower Co., Seattle, Wash.
Western Precipitation Corp., Los Angeles, Calif.
Whiting Corp., Harvey, Ill.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
Young & Bertke Co., Cincinnati, O.

## COMBUSTION CONTROL

*See Controls, Draft, Barometric; Regulators, Draft, Combustion; Systems, Combustion Control*

## COMBUSTION RECORDERS

*See Recorders, Carbon Dioxide*

## COMPOUNDS, AIR FRESHENING

Lundy Co., E. A., New York, N. Y.
● Wheeler, Inc., W. H., New York, N. Y.

## COMPOUNDS, BOILER CLEANING

Acme Refining Co., The, Cleveland, O.
Agnew & Tomlinson, New York, N. Y.
American K. A. T. Corp., New York, N. Y.
American Teksag Products, Inc., Mount Vernon, N. Y.
Anderson-Stolz Corp., Kansas City, Mo.
Aquatic Chemical Laboratories, Inc., New York, N. Y.
Bird-Archer Co., Philadelphia, Pa.
Blue Seal Chemical Co., Roselle Park, N. J.
Brown-Ford Corp., Newton, Mass.
Cannon Chemical Co., Everett, Mass.
Chicago Specialty Mfg. Co., Chicago, Ill.
Continental Products Co., Euclid, O.
Dearborn Chemical Co., Chicago, Ill.
Diamond Chemical Products, New York, N. Y.
Ferro-Nil Corp., New York, N. Y.
Grief, Edward C., Bogota, N. J.
Haering & Co., Inc., D. W., Chicago, Ill.
Hagan Corp., Pittsburgh, Pa.
Hercules Chemical Co., Inc., New York, N. Y.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Krehbiel Co., J. H., Chicago, Ill.
Metropolitan Refining Co., Inc., Long Island City, N. Y.
National Aluminate Corp., Chicago, Ill.
North American Fibre Products Co., The, Cleveland, O.
Permutit Co., New York, N. Y.
Radiator Specialty Co., Charlotte, N. C.
Turco Products, Inc., Los Angeles, Calif.
Utility Laboratory, Inc., Brooklyn, N. Y.
Vinco Co., Inc., The, New York, N. Y.
Water Service Laboratories, Inc., New York, N. Y.
Western Chemical Co., Kansas City, Mo.
● X Laboratories, Inc., New York, N. Y.

## COMPOUNDS, BOILER AND RADIATOR SEALING

Atlas Chemical Co., Marietta, O.
Blue Seal Chemical Co., Roselle Park, N. J.
Cannon Chemical Co., Everett, Mass.
Chicago Specialty Mfg. Co., Chicago, Ill.
Cooper Sanitary Co., Philadelphia, Pa.
Dearborn Chemical Co., Chicago, Ill.
Desolvo Co., The, Pittsburgh, Pa.
Halowax Products Div., Union Carbide & Carbon Corp., New York, N. Y.
Hampton-Cross Co., The, Louisville, Ky.

● Advertisement in this issue. See Index to Advertisers, page 350.

- Hercules Chemical Co., Inc., New York, N. Y.
- Krehbiel Co., J. H., Chicago, Ill.
- Metropolitan Refining Co., Inc., Long Island City, N. Y.
- National Engineering Products, Inc., Washington, D. C.
- Permatex Co., Inc., Brooklyn, N. Y.
- Radiator Specialty Co., Charlotte, N. C.
- Star Products Co., New York, N. Y.
- Utility Laboratory, Inc., Brooklyn, N. Y.
- Vinco Co., Inc., The, New York, N. Y.
- ● X Laboratories, Inc., New York, N. Y.

## COMPOUNDS, CAULKING

- Accurate Metal Weather Strip Co., New York, N. Y.
- Acme Refining Co., The, Cleveland, O.
- Acme White Lead & Color Works, Detroit, Mich.
- Acorn Refining Co., Cleveland, O.
- All Metal Weatherstrip Co., Chicago, Ill.
- Alpha Metals, Inc., Brooklyn, N. Y.
- American-Marietta Co., Chicago, Ill.
- American Metal Weather Strip Co., Grand Rapids, Mich.
- Armstrong Co., The, Detroit, Mich.
- Asphalt Products Co., Syracuse, N. Y.
- Babbitt Industrial Specialties Co., New York, N. Y.
- Barland Weatherstrip Material Co., Cleveland, O.
- Blue Ridge Talc Co., Henry, Va.
- Calbar Paint & Varnish Co., Philadelphia, Pa.
- Carey Mfg. Co., Philip, Cincinnati, O.
- Carter Paint Co., Liberty, Ind.
- Chamberlin Metal Weather Strip Co., Detroit, Mich.
- Cheeseman-Elliot Co., Inc., Brooklyn, N. Y.
- Clinton Metallic Paint Co., Clinton, N. Y.
- Continental Products Co., Euclid, O.
- Cordo Chemical Co., Norwalk, Conn.
- Eagle-Picher Lead Co., Cincinnati, O.
- Flintkote Co., The, New York, N. Y.
- Ford Roofing Products Co., Chicago, Ill.
- Glidden Co., Cleveland, O.
- Goodrich Co., B. F., Akron, O.
- Hetzel Roofing Products Co., Newark, N. J.
- Horn Co., A. C., Long Island City, N. Y.
- Iowa Paint Mfg. Co., Des Moines, Ia.
- Johns-Manville, New York, N. Y.
- Krehbiel Co., J. H., Chicago, Ill.
- Lastik Products Co., Inc., Pittsburgh, Pa.
- Lehon Co., Chicago, Ill.
- Maas & Waldstein Co., Newark, N. J.
- Metropolitan Refining Co., Inc., Long Island City, N. Y.
- Midland Paint & Varnish Co., Cleveland, O.
- ● Mortell Co., J. W., Kankakee, Ill.
- National Mfg. Corp., Tonawanda, N. Y.
- Nebel Mfg. Co., Cleveland, O.
- North American Fibre Products Co., The, Cleveland, O.
- Ohmlac Paint & Refining Co., Chicago, Ill.
- Pecora Paint Co., Philadelphia, Pa.
- Pittsburgh Plate Glass Co., Pittsburgh, Pa.
- Plastic Products Co., Detroit, Mich.
- Presstite Engineering Co., St. Louis, Mo.
- Pyrolite Products Co., Cleveland, O.
- Quigley Co., Inc., New York, N. Y.
- Radiator Specialty Co., Charlotte, N. C.
- Reilly Tar & Chemical Corp., Indianapolis, Ind.
- Sherwin-Williams Co., The, Cleveland, O.
- Sipe & Co., James B., Pittsburgh, Pa.
- Smooth-On Mfg. Co., Jersey City, N. J.
- Sonneborn Sons, Inc., L., New York, N. Y.
- Southport Paint Co., Div. Wesson Oil & Snowdrift Co., Inc., Savannah, Ga.
- Tamms Silica Co., Chicago, Ill.
- Thompson & Co., Pittsburgh, Pa.
- Tropical Paint & Oil Co., Cleveland, O.
- Truscon Laboratories, Detroit, Mich.
- United States Stoneware Co., New York, N. Y.
- Wilhelm Co., A., Reading, Pa.
- X-Pando Corp., Long Island City, N. Y.
- Yardley Screen & Weather Strip Corp., Columbus, O.

## COMPOUNDS, CLEANING, PIPE COIL AND CONDENSER

- Anderson-Stolz Corp., Kansas City, Mo.
- Apex All Weather Products, Chicago, Ill.
- Aquatic Chemical Laboratories, Inc., New York, N. Y.
- Blue Seal Chemical Co., Roselle Park, N. J.
- Cannon Chemical Co., Everett, Mass.
- Dearborn Chemical Co., Chicago, Ill.
- Dowell, Inc., Tulsa, Okla.
- Haering Co., Inc., D. W., Chicago, Ill.
- Hercules Chemical Co., Inc., New York, N. Y.
- National Airoil Burner Co., Inc., Philadelphia, Pa.
- North American Fibre Products Co., The, Cleveland, O.
- Oakite Products, Inc., New York, N. Y.
- Radiator Specialty Co., Charlotte, N. C.
- Turco Products, Inc., Los Angeles, Calif.
- Utility Laboratory, Inc., Brooklyn, N. Y.
- Western Chemical Co., Kansas City, Mo.

## COMPOUNDS, WELDING

- American Solder & Flux Co., Philadelphia, Pa.
- Midland Paint & Varnish Co., Cleveland, O.
- Turco Products, Inc., Los Angeles, Calif.

- Universal Power Corp., Cleveland, O.
- Wolfe-Kote Co., Sheboygan, Wis.

## COMPRESSION PIPE FITTINGS

*See Fittings, Pipe, Compression*

## COMPRESSOR BASES

*See Bases and Pads, Vibration Isolating*

## COMPRESSOR VALVES

*See Valves, Compressor*

## COMPRESSORS, AIR

- Allen Billmyre Co., Mamaroneck, N. Y.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- American-Marsh Pumps, Inc., Battle Creek, Mich.
- Beach-Russ Co., New York, N. Y.
- Binks Mfg. Co., Chicago, Ill.
- Brunner Mfg. Co., Utica, N. Y.
- Bury Compressor Co., Erie, Pa.
- Chicago Pneumatic Tool Co., New York, N. Y.
- Cooper Co., Clark, Palmyra, N. J.
- ● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis Mo.
- Davey Compressor Co., Kent, O.
- Dayton Air Compressor Co., Dayton, O.
- DeVilbiss Co., The, Toledo, O.
- Essick Mfg. Co., Los Angeles, Calif.
- Fuller Co., Catasauqua, Pa.
- Gardner-Denver Co., Quincy, Ill.
- Gilbert & Barker Mfg. Co., West Springfield, Mass.
- Hobart Bros. Co., Troy, O.
- ● Ingersoll-Rand Co., New York, N. Y.
- Lammert & Mann Co., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- ● Nash Engineering Co., South Norwalk, Conn.
- North Penn Co., New York, N. Y.
- Pennsylvania Pump & Compressor Co., Easton, Pa.
- Plummer Spray Equipment Co., Napoleon, O.
- Schramm, Inc., West Chester, Pa.
- Spencer Turbine Co., Hartford, Conn.
- ● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Sullivan Machinery Co., Michigan City, Ind.
- Trimount Rotary Power Co., East Dedham, Mass.
- Uniflow Mfg. Co., Erie, Pa.
- Union Steam Pump Co., Battle Creek, Mich.
- Worthington Pump & Machinery Corp., Harrison, N. J.
- Yeomans Bros. Co., Chicago, Ill.

## COMPRESSORS, REFRIGERATING, CENTRIFUGAL

- Carrier Corp., Syracuse, N. Y. (Carrene)
- DeLaval Steam Turbine Co., Trenton, N. J. (Water vapor)
- ● Ingersoll-Rand Co., New York, N. Y. (Water vapor)
- ● Trane Co., The La Crosse, Wis.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- Yeomans Bros. Co., Chicago, Ill.
- ● York Corp., York, Pa.

## COMPRESSORS, REFRIGERATING, RECIPROCATING

- ● Airtemp, Div. of Chrysler Corp., Dayton, O. (Radial)
- ● Baker Ice Machine Co., Inc., Omaha, Nebr. ("Freon," Methyl chloride, Ammonia)
- Brunner Mfg. Co., Utica, N. Y. (Methyl chloride, "Freon," sulphur dioxide)
- Carrier Corp., Syracuse, N. Y. ("Freon")
- Copeland Refrigeration Corp., Sidney, O.
- ● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis. Mo.
- Diceler Corp., The, Gasport, N. Y.
- Frick Co., Waynesboro, Pa. (Ammonia, carbon dioxide, methyl chloride, "Freon")
- Frigidaire Div., General Motors Corp., Dayton, O.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Machinery Co., Spokane, Wash.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Howe Ice Machine Co., Chicago, Ill. ("Freon," ammonia, methyl chloride)
- ● Ingersoll-Rand Co., New York, N. Y.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Kelvinator Div., Nash-Kelvinator Corp., Detroit, Mich.
- Lynch Mfg. Corp., Defiance, O.
- Merchant & Evans Co., Philadelphia, Pa. ("Freon," methyl chloride, sulphur dioxide)
- Mills Industries, Inc., Chicago, Ill.
- Phoenix Ice Machine Co., Cleveland, O.
- Reliance Refrigerating Machine Co., Chicago, Ill. ("Freon," methyl chloride, ammonia)
- Reynolds Mfg. Co., Inc., Springfield, Mo.
- Servel, Inc., Electric Refrigeration & Air Conditioning Div., Evansville, Ind. ("Freon," methyl chloride)
- Starr Piano Co., Richmond, Ind.
- Stewart Ice Machine Co., Los Angeles, Calif.
- Tecumseh Products Co., Tecumseh, Mich.
- ● Trane Co., The, La Crosse, Wis.
- Universal Cooler Corp., Marion, O. (Methyl chloride, "Freon")
- Vilter Mfg. Co., Milwaukee, Wis. ("Freon," ammonia)
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- Williams Oil-O-Matic Heating Corp., Bloomington, Ill. ("Freon," methyl chloride)

● Advertisement in this issue. See Index to Advertisers, page 350.

- Wittenmeier Machinery Co., Chicago, Ill. (Carbon dioxide)
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigerating Co., Chicago, Ill. (Ammonia, methyl chloride)
- ● York Corp., York, Pa. (Carbon dioxide, ammonia, "Freon")

## COMPRESSORS, REFRIGERATING, STEAM JET

- Croll-Reynolds Engrg. Co., Inc., New York, N. Y.
- Elliott Co., Jeannette, Pa.
- ● Ingersoll-Rand Co., New York, N. Y.
- Schutte & Koerting Co., Philadelphia, Pa.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Wheeler Mfg. Co., C. H., Philadelphia, Pa.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.

## COMPRESSORS, STEAM BOOSTER

- ● Ingersoll-Rand Co., New York, N. Y.
- Pennsylvania Pump & Compressor Co., Easton, Pa.
- Schutte & Koerting Co., Philadelphia, Pa.
- Worthington Pump & Machinery Corp., Harrison, N. J.

## CONDENSATION METERS

*See Meters, Condensation*

## CONDENSATION PUMPS

*See Pumps, Condensation*

## CONDENSERS, REFRIGERATING, EVAPORATIVE

- ● Acme Industries, Inc., Jackson, Mich.
- American Cooling Tower Co., Kansas City, Mo.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Carrier Corp., Syracuse, N. Y
- ● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
- ● Drayer & Hanson, Inc., Los Angeles, Calif.
- Frick Co., Waynesboro, Pa.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G & O Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Governair Corp., Oklahoma City, Okla.
- Harry Cooling Towers, Inc., New York, N. Y.
- Hess Warming & Ventilating Co., Chicago, Ill.
- Larkin Coils, Inc., Atlanta, Ga.
- Long Mfg., Div. Borg-Warner Corp., Detroit, Mich.
- ● Marlo Coil Co., St. Louis, Mo.
- McQuay, Inc., Minneapolis, Minn.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- ● New England Cooling Tower Co., Boston, Mass.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Marion, Ind.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Richmond Engrg. Co., Inc., Richmond, Va.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Whiting Corp., Harvey Ill.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigerating Co., Chicago, Ill.
- Yates-American Machine Co., Beloit, Wis.
- ● York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

## CONDENSERS, REFRIGERATING, SHELL AND COIL

- ● Acme Industries, Inc., Jackson, Mich.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- Downingtown Iron Works, Downingtown, Pa.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Merchant & Evans Co., Philadelphia, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Vilter Mfg. Co., Milwaukee, Wis.
- ● Whitlock Mfg. Co., Hartford, Conn.
- ● Young Radiator Co., Racine, Wis.

## CONDENSERS, REFRIGERATING, SHELL AND TUBE

- ● Acme Industries, Inc., Jackson, Mich.
- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Biggs Boiler Works Co., E. Akron, O.
- Carrier Corp., Syracuse, N. Y. (Carrene)
- Chase Brass & Copper Co., Waterbury, Conn.
- ● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
- Davis Engineering Corp., Elizabeth, N. J.
- Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
- Downingtown Iron Works, Downingtown, Pa.
- ● Drayer & Hanson, Inc., Los Angeles, Calif.
- Frick Co., Waynesboro, Pa.
- Frigidaire Div., General Motors Corp., Dayton, O.
- General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Heat Transfer Products, Inc., New York, N. Y.
- Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
- Howe Ice Machine Co., Chicago, Ill.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- ● Kramer Trenton Co., Trenton, N. J.
- Merchant & Evans Co., Philadelphia, Pa.
- Ohio Pipe Bending & Machine Co., Cleveland, O.
- Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Refrigeration Economics Co., Inc., Canton, O.
- Reliance Refrigerating Machine Co., Chicago, Ill.
- Reynolds Mfg. Co., Inc., Springfield, Mo.
- Richmond Engrg. Co., Inc., Richmond, Va.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Servel, Inc., Electric Refrigeration & Air Conditioning Div., Evansville, Ind.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Stewart Ice Machine Co., Los Angeles, Calif.
- Struthers Wells Corp., Titusville, Pa.
- ● Trane Co., The, LaCrosse, Wis.
- Union Steam Pump Co., Battle Creek, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- ● Whitlock Mfg. Co., Hartford, Conn.
- Wittenmeier Machinery Co., Chicago, Ill.
- Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigrating Co., Chicago, Ill.
- ● York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.
- Zallea Brothers & Johnson, Wilmington, Del.

## CONDENSING UNITS

*See Compressors*

## CONDUIT, UNDERGROUND PIPING

- ● American District Steam Co., North Tonawanda, N. Y.
- ● Byers Co., A. M., Pittsburgh, Pa. (Wrought iron)
- Dockstader, S. E., Washington, D. C.
- Ehret Magnesia Mfg. Co., Valley Forge, Pa.
- Johns-Manville, New York, N. Y.
- Michigan Pipe Co., Bay City, Mich.
- ● Porter & Co., Inc., H. W., Newark, N. J.
- ● Ric-wiL Co., Cleveland, O.
- ● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
- Underground Steam Construction Co., Boston, Mass.
- Wyckoff & Son Co., A., Elmira, N. Y.

## CONNECTIONS, DUCT, FLEXIBLE (ASBESTOS, CANVAS, ETC.)

- Canvas Products Co., St. Louis, Mo.
- Chicago Metal Hose Corp., Maywood, Ill.
- Felters Co., Inc., Boston, Mass.
- United States Rubber Co., New York, N. Y.
- ● Wilson, Inc., Grant, Chicago, Ill. (Asbestos)

## CONNECTORS, FOR NON-METALLIC DUCT FABRICATION

- Acme Steel Co., Chicago, Ill. (strapping)
- ● Dravo Corp., Pittsburgh, Pa.
- Klomparens Lock-Joint Co., Arlington, Va.
- Lumm Co., A. H., Toledo, O.
- Steetlock Co., Chicago, Ill.
- United States Rubber Co., New York, N. Y.

## CONTROL, FOR INDIRECT WATER HEATERS

- Armstrong Heat Control Co., Portland, Ore.
- ● Barber-Colman Co., Rockford, Ill.
- ● Bell & Gossett Co., Morton Grove, Ill.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● Mercoid Corp., The, Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Sarcotherm Controls, Inc., Chicago, Ill.
- Taco Heaters, Inc., New York, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.

## CONTROLLERS AND STARTERS, MOTOR

- Allen-Bradley Co., Milwaukee, Wis.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
- B/W Controller Corp., Birmingham, Mich.
- Borg-Erickson Corp., Chicago, Ill.
- Clark Controller Co., Cleveland, O.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Electric Controller & Mfg. Co., Cleveland, O.
- Electric Machinery Co., Minneapolis, Minn. (Synchronous motor)
- General Electric Co., Schenectady, N. Y.
- Hart Mfg. Co., Hartford, Conn.
- Monitor Controller Co., The, Baltimore, Md.
- ● Penn Electric Switch Co., Goshen, Ind.
- Reynolds Electric Co., Chicago, Ill.
- Square D Co., Industrial Controller Div., Milwaukee, Wis.
- Trumbull Electric Mfg. Co., Plainville, Conn.
- ● Ward Leonard Electric Co., Mt. Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Zenith Electric Co., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

## CONTROLS, AIR CONDITIONING

*See Humidistats; Indicator-Controllers; Operators, Dampers; Operators, Valve; Recorder-Controllers; Regulators; Relays; Switches; Thermostats; Valves, Diaphragm; Valves, Refrigeration; Valves, Solenoid*

## CONTROLS, DOOR, ELECTRIC EYE (FOR AIR CONDITIONED ROOMS)

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## CONTROLS, DRAFT, BAROMETRIC

● Barber-Colman Co., Rockford, Ill.
Cole-Sullivan Engineering Co., Minneapolis, Minn.
Field Control Div., H. D. Conkey & Co., Mendota, Ill.
Hotstream Heater Co., Cleveland, O.
Perfex Corp., Milwaukee, Wis.
Preferred Utilities Mfg. Corp., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Simplex Mfg. Co., Fond du Lac, Wis.

## CONTROLS, FIRE PROTECTION SPRINKLER SYSTEMS

● Barber-Colman Co., Rockford, Ill.
● Grinnell Co., Inc., Providence, R. I.
Rockwood Sprinkler Co., Worcester, Mass.
Synchro-Start Products, Chicago, Ill.
Worner Electronic Devices, Chicago, Ill.

## CONTROLS, HEATING

*See Alarms; Humidistats; Indicator-Controllers; Operators, Damper; Operators, Valve; Recorder-Controllers; Regulators; Relays; Switches; Systems, Combustion Control; Systems, Heating; Thermostats; Valves, Balancing, Radiator; Valves, Diaphragm; Valves, Flow Control; Valves, Mixing; Valves, Pressure Reducing and Regulating; Valves, Radiator; Valves, Solenoid*

## CONTROLS, PUSH-PULL

*See Shafts, Flexible, Push-Pull, for Control*

## CONTROLS, REFRIGERATION

*See Humidistats; Operators, Valves; Relays; Switches; Thermostats; Valves, Refrigeration; Valves, Solenoid*

## CONVECTORS

*See Radiation, Convection Type*

## CONVEYORS, COAL AND ASH

Chain Belt Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
● La-Del Conveyor & Mfg. Co., New Philadelphia, O.
● Link-Belt Co., Chicago, Ill.
● Stephens-Adamson Mfg. Co., Aurora, Ill.

## COOLERS, OIL

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Andale Co., Philadelphia, Pa.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Brown Fintube Co., The, Elyria, O.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Davis Engineering Corp., Elizabeth, N. J.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Downingtown Iron Works, Downingtown, Pa.
Elliott Co., Jeannette, Pa.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
Frank Heaters, Inc., Paterson, N. J.
● G & O Mfg. Co., New Haven, Conn.
Griscom-Russell Co., The, New York, N. Y.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
● Kramer Trenton Co., Trenton, N. J.
● Modine Mfg. Co., Racine, Wis.
● Murray Mfg. Co., D. J., Wausau, Wis.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Refrigeration Economics Co., Inc., Canton, O.
Rome-Turney Radiator Co., Rome, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Struthers Wells Corp., Titusville, Pa.
● Trane Co., The, La Crosse, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.
● Whitlock Mfg. Co., Hartford, Conn.
Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.
Zallea Brothers & Johnson, Wilmington, Del.

## COOLERS, UNIT (FLOOR TYPE)

*Not air conditioning units, but floor mounted unit with coil and centrifugal fans without filters, for connection to remote compressor or cold water supply. For air conditioning units see Units, Air Conditioning*

● Acme Industries, Inc., Jackson, Mich.
American Blower Corp., Detroit, Mich.
American Coils, Inc., Newark, N. J.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
● Buffalo Forge Co., Buffalo, N. Y.
● Bush Mfg. Co., Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Conditionaire Unit Co., Chicago, Ill.
● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
● Drayer & Hanson, Inc., Los Angeles, Calif.
Economy Equipment Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
● Marlo Coil Co., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Engineering Co., Inc., Richmond, Va.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
X L Refrigerating Co., Chicago, Ill.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

## COOLERS, UNIT (SUSPENDED TYPE)

*Not air conditioning units, but suspended unit with coil and propeller fan, without filters, for connection to remote compressor or cold water supply. For air conditioning units, see Units, Air Conditioning*

American Blower Corp., Detroit, Mich.
American Coils, Inc., Newark, N. J.
● Baker Ice Machine Co., Inc., Omaha, Nebr.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Bern's Specialty Mfg. Co., Chicago, Ill.
Betz Corp., Hammond, Ind.
● Buffalo Forge Co., Buffalo, N. Y.
● Bush Mfg. Co., Hartford, Conn.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Conditionaire Unit Co., Chicago, Ill.
● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
● Drayer & Hanson, Inc., Los Angeles, Calif.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Howe Ice Machine Co., Chicago, Ill.
● Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Corp., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
King Ventilating Co., Owatonna, Minn.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
● Marlo Coil Co., St. Louis, Mo.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
Merchant & Evans Co., Philadelphia, Pa.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Richmond Engrg. Co., Inc., Richmond, Va.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Super Radiator Corp., Minneapolis, Minn.
Thermal Co., Inc., Milwaukee, Wis.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
● Wing Mfg. Co., L. J., New York, N. Y.
X L Refrigerating Co., Chicago, Ill.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

## COOLING COILS

*See Surface, Cooling*

## COOLING SURFACE

*See Surface, Cooling*

● Advertisement in this issue. See Index to Advertisers, page 350.

## COOLING TOWERS

*See Towers, Cooling*

## COOLING UNITS

*See Units, Air Conditioning; Coolers, Unit*

## COPPER PIPE

*See Pipe, Brass and Copper*

## COPPER SHEETS·

*See Sheets, Copper*

## COPPER TUBE FITTINGS

*See Fittings, Copper Tube*

## COPPER TUBING

*See Tubing, Brass and Copper*

## CORROSION PREVENTIVES

*See Treatment, Steam System, to Inhibit Corrosion; and Treatment, Water, to Inhibit Corrosion*

## COUNTERS, DUST

Bausch & Lomb Optical Co., Rochester, N. Y.
Eimer & Amend, New York, N. Y.
Service to Industry, West Hartford, Conn.
Willson Products, Inc., Reading, Pa.

## COUPLINGS, FLEXIBLE, POWER TRANSMISSION

Ajax Flexible Coupling Co., Westfield, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Flexible Coupling Co., Erie, Pa.
Blood Brothers Machine Co., Allegan, Mich. (Universal joints)
Boston Gear Wks., Inc., North Quincy, Mass.
Browning Mfg. Co., Inc., Maysville, Ky.
Caldwell Co., W. E., Louisville, Ky.
Certified Flexible Couplings, New York, N. Y.
Chain Belt Co., Milwaukee, Wis.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Continental Diamond Fibre Co., Newark, Del.
● Crocker-Wheeler Electric Mfg. Co. Div., Joshua Hendy Iron Works, Ampere, N. J.
De Laval Steam Turbine Co., Trenton, N. J.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Dodge Mfg. Corp., Mishawaka, Ind.
Guardian Utilities Co., Michigan City, Ind.
Jeffrey Mfg. Co., Columbus, O.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
● Link-Belt Co., Indianapolis, Ind.
● Lord Mfg. Co., Erie, Pa.
Lovejoy Flexible Coupling Co., Chicago, Ill.
Medart Co., St. Louis, Mo.
Moran Flexible Steam Joint Co., Louisville, Ky.
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Inc., Philadelphia, Pa.
Poole Foundry & Machine Co., Baltimore, Md.
Ramsey Chain Co., Inc., Albany, N. Y.
Smallcross Co., Philadelphia, Pa.
Smith, Inc., Winfield H., Springville, N. Y.
Stewart-Rogers, Inc., Philadelphia, Pa.
Stow Mfg. Co., Binghampton, N. Y.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
United States Rubber Co., New York, N. Y.
Waldron Corp., John, New Brunswick, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whitney Chain & Mfg. Co., The, Hartford, Conn.
Wood's Sons Co., T. B., Chambersburg, Pa.

## COUPLINGS, PIPE

● Aeroquip Corp., Jackson, Mich.
Alabama Pipe Co., Anniston, Ala. (Cast iron)
● Byers Co., A. M., Pittsburgh, Pa. (wrought iron)
Champion Machine & Forging Co., Cleveland, O.
Clow & Sons, James B., Chicago, Ill.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Works, Detroit, Mich.
Dillon Co., Tulsa, Okla.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Gustin Bacon Mfg. Co., Kansas City, Mo.
H. & B. Sales Co., Ltd., Long Beach, Calif. (Swing joint)
Hanlon-Waters, Tulsa, Okla.
Harrisburg Steel Corp., Harrisburg, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jefferson Union Co., Lockport, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Malleable Iron Fittings Co., Branford, Conn.
● Mueller Brass Co., Port Huron, Mich.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Parker Appliance Co., The, Cleveland, O.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Ravena Iron Co., Ravena, N. Y. (Cast iron)
● Republic Steel Corp., Cleveland, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Semler Co., Jeannette, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Superior Railway Products Corp., Pittsburgh, Pa.
Union Metal Works, Chelsea, Mass.
United States Stoneware Co., New York, N. Y.
Victaulic Co. of America, New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Weatherhead Co., Cleveland, O.
Wheeling Machine Products Co., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

## COUPLINGS, PIPE, DETACHABLE

● Aeroquip Corp., Jackson, Mich.
Packless Metal Products Corp., New Rochelle, N. Y.
Victaulic Co. of America, New York, N. Y.
Wiggins Oil Tool Co., Inc., E. B., Los Angeles, Calif.

## CUT-OFFS, LOW WATER, HEATING BOILER

B/W Controller Corp., Birmingham, Mich.
● General Controls Co., Glendale, Calif.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Maid-O'-Mist, Inc., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Schaub Engineering Co., Fred H., Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

## CUTTERS, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Barnes Tool Co., The, New Haven, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Bernz Co., Inc., Otto, Rochester, N. Y.
C-B Tool Co., Lancaster, Pa.
Crown Die & Tool Co., Chicago, Ill.
Erie Tool Works, Erie, Pa.
Hollands Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
International Nutyp Tool Co., Oswego, N. Y.
National Machine Wks., Chicago, Ill.
Nye Tool & Machine Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
● Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.
Trimont Mfg. Co., Boston, Mass.
Wallace Supplies Mfg. Co., Chicago, Ill.

## CUTTERS, TUBING

Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Bernz Co., Inc., Otto, Rochester, N. Y.
● Bonney Forge & Tool Works, Allentown, Pa.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
● Mueller Brass Co., Port Huron, Mich.
Nye Tool & Machine Co., Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Perfection Refrigeration Parts Co., Harvey, Ill.
● Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Trimont Mfg. Co., Boston, Mass.
Wallace Supplies Mfg. Co., Chicago, Ill.
Weatherhead Co., Cleveland, O.

## DAMPER OPERATORS

*See Operators, Damper*

## DAMPER REGULATORS

*See Regulators, Damper Sets*

## DAMPERS, DUCT, MANUALLY OPERATED

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Adams Co., The, Dubuque, Ia.
Air Conditioning Products Co., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Belanger Fan & Blower Co., Detroit, Mich.
Corbman Bros., Inc., Philadelphia, Pa.
Elgo Shutter & Mfg. Co., Detroit, Mich.
Excelsior Steel Furnace Co., Chicago, Ill.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Jacobs Co., B. & J., Cincinnati, O.
Kerentoff, G. L., Cincinnati, O.
Meyer Mfg. Co., Detroit, Mich.
Ohio Products Co., Cleveland, O.

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Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Salina Metal Products Co., Salina, Kans.
United States Register Co., Battle Creek, Mich.
Waterloo Register Co., Waterloo, Ia.
Young Regulator Co., Cleveland, O.

## DAMPERS, DUCT, REMOTE CONTROLLED

Air Conditioning Products Co., Detroit, Mich.
American Warming & Ventilating Co., Toledo, O.
● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Belanger Fan & Blower Co., Detroit, Mich.
Brooke Engineering Co., Inc., Philadelphia, Pa.
● Johnson Service Co., Milwaukee, Wis.
Meyer Mfg. Co., Detroit, Mich.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
● Powers Regulator Co., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Stuart Co., W. W., Des Moines, Ia.
Thermix Engineering Co., Greenwich, Conn.
● Tuttle & Bailey, Inc., New Britain, Conn.
Vapor Car Heating Co., Inc., Chicago, Ill.
Waterloo Register Co., Waterloo, Ia.
Young Regulator Co., Cleveland, O.

## DEAERATORS

Cochrane Corp., Philadelphia, Pa.
Croll-Reynolds Engrg. Co., Inc., New York, N. Y.
Elliott Co., Jeannette, Pa.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Heat Transfer Products, Inc., New York, N. Y.
Hoppes Mfg. Co., Springfield, O.
Permutit Co., New York, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sims Co, Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
● Swartwout Co., Cleveland, O.
● Whitlock Mfg. Co., Hartford, Conn.
Worthington Pump & Machinery Corp., Harrison, N. J.

## DEEP WELL PUMPS

*See Pumps, Deep Well*

## DEHUMIDIFIERS, ABSORPTION AND ADSORPTION

● Air & Refrigeration Corp., New York, N. Y.
Aqua-Sorb Co., East Orange, N. J.
● Bryant Heater Co., The, Cleveland, O. (Silica gel)
Carbide and Carbon Chemicals Corp., New York, N. Y. (Triethylene Glycol)
Cargocaire Engineering Corp., New York, N. Y. (for ships)
Carrier Corp., Syracuse, N. Y.
Davison Chemical Corp., The, Baltimore, Md.
Drying Systems, Inc., Chicago, Ill.
Floridin Co., Warren, Pa.
General Air Conditioning Corp., Cincinnati, O.
Kaufman Co., H. J., Detroit, Mich.
Pittsburgh Lectrodryer Corp., Pittsburgh, Pa.
Research Corp., New York, N. Y.
Solvay Sales Corp., New York, N. Y.
● Surface Combustion, Toledo, O.
Tamms Silica Co., Chicago, Ill.

## DEHUMIDIFYING UNITS

*See Units, Air Conditioning; Dehumidifiers, Absorption and Adsorption*

## DEHYDRANT AND ACID NEUTRALIZER, FOR REFRIGERATING SYSTEMS

American Injector Co., Detroit, Mich.
Davison Chemical Corp., The, Baltimore, Md.
Highside Chemicals Co., Newark, N. J.
Weatherhead Co., Cleveland, O.

## DEHYDRATORS, REFRIGERANT

Aluminum Co. of America, Pittsburgh, Pa.
American Injector Co., Detroit, Mich.
● Automatic Products Co., Milwaukee, Wis.
Davison Chemical Corp., The, Baltimore, Md.
Floridin Co., Warren, Pa.
Henry Valve Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Research Products Corp., Madison, Wis.
Superior Valve and Fittings Co., Pittsburgh, Pa.
Weatherhead Co., Cleveland, O.

## DESTROYERS, SOOT, CHEMICAL

Desolvo Co., The, Pittsburgh, Pa.
Healy Ruff Co., St. Paul, Minn.
Hercules Chemical Co., Inc., New York, N. Y.
Tamms Silica Co., Chicago, Ill.
Vinco Co., Inc., The, New York, N. Y.

## DESUPERHEATERS, STEAM

Babcock & Wilcox Co., New York, N. Y.
Brown Fintube Co., The, Elyria, O.
Dri-Steam Products, Inc., New York, N. Y.
Edge Moor Iron Works, Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
Hagan Corp., Pittsburgh, Pa.
Northern Equipment Co., Erie, Pa.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
● Whitlock Mfg. Co., Hartford, Conn.

## DETECTORS, LEAK, REFRIGERANT

Bernz Co., Inc., Otto, Rochester, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Schaub Engineering Co., Fred H., Chicago, Ill. (Leak alarm)
Turco Products, Inc., Los Angeles, Calif.
Turner Brass Wks., Sycamore, Ill.
● Western Thermal Equipment Co., Los Angeles, Calif.

## DIAPHRAGM VALVES

*See Valves, Diaphragm*

## DIESEL ENGINES

*See Engines, Diesel, for Fan, Pump and Compressor Drives*

## DIFFUSERS, AIR, HIGH VELOCITY

*See also Grilles; Panels, Perforated, for Air Diffusion; Registers*

Air Devices, Inc., New York, N. Y.
● Air & Refrigeration Corp., New York, N. Y.
Anemostat Corp. of America, New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
● Connor Engineering Corp., W. B., New York, N. Y.
Demuth & Sons, Charles, Mineola, L. I., N. Y.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Guth Co., Edwin F., St. Louis, Mo.
● Tuttle & Bailey, Inc., New Britain, Conn.
Waterloo Register Co., Waterloo, Ia.
Wilster Air Devices, Inc., Cleveland, O.

## DIFFUSION, AIR

*See Panels, Perforated, for Air Diffusion*

## DOOR CONTROLS

*See Controls, Door, Electric Eye*

## DOORS AND PANELS, ACCESS

American Foundry & Furnace Co., Bloomington, Ill.
American Sheet Metal Works, New Orleans, La.
● Auer Register Co., Cleveland, O.
Biersach & Niedermeyer Co., Milwaukee, Wis.
● Clarage Fan Co., Kalamazoo, Mich.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Decatur Iron & Steel Co., Decatur, Ala.
Falstrom Co., Passaic, N. J.
Kirk & Blum Mfg. Co., Cincinnati, O.
Lockjoint Wood Products Co., Wichita, Kans.
Milcor Steel Co., Milwaukee, Wis.
Rock Island Register Co., Rock Island, Ill.
Technical Ply-Woods, Chicago, Ill.
Truscon Steel Co., Youngstown, O.
● Tuttle & Bailey, Inc., New Britain, Conn.
Way Loctor Access Panel Co., Boston, Mass.

## DRAFT CONTROL

*See Controls, Draft, Barometric; Regulators, Draft, Combustion*

## DRAFT GAGES

*See Gages, Indicating, Draft*

## DRAFT RECORDERS

*See Recorders, Draft*

## DRAFT REGULATORS

*See Controls, Draft, Barometric; Regulators, Draft, Combustion*

## DRILLS, ELECTRIC, PORTABLE

Albertson & Co., Inc., Sioux City, Ia.
Black & Decker Mfg. Co., Towson, Md.
Buckeye Portable Tool Co., Dayton, O.
Chicago Pneumatic Tool Co., New York, N. Y.
Cincinnati Electrical Tool Co., The, Cincinnati, O.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Duro Metal Products Co., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
Keller Tool Co., Grand Haven, Mich.
Mall Tool Co., Chicago, Ill.
Millers Falls Co., Greenfield, Mass.
Misener Mfg. Co., Inc., Syracuse, N. Y.
Paramount Products Co., New York, N. Y.
Signal Electric Mfg. Co., Menominee, Mich.
Skilsaw, Inc., Chicago, Ill.
Snap-On Tools Corp., Kenosha, Wis.
Speedway Mfg. Co., Chicago (Cicero), Ill.
Stanley Electric Tools, Div. of The Stanley Works, New Britain, Conn.
Syntron Co., Homer City, Pa.
U. S. Electrical Tool Co., Cincinnati, O.
Van Dorn Electric Tool Co., Towson, Md.
Willy's Carbide Tool Co., Detroit, Mich.
Wodack Electric Tool Corp., Chicago, Ill.
York Electric & Machine Co., York, Pa.

## DRIVES, CHAIN

Caldwell Co., W. E., Louisville, Ky.
Chain Belt Co., Milwaukee, Wis.
Diamond Chain & Mfg. Co., Indianapolis, Ind.

● Advertisement in this issue. See Index to Advertisers, page 350.

Jeffrey Mfg. Co., Columbus, O.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., The, Hartford, Conn.

## DRIVES, FLAT BELT

*See also Belting, Leather and Belting, Rubber*

American Pulley Co., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Browning Mfg. Co., Inc., Maysville, Ky.
Caldwell Co., W. E., Louisville, Ky.
Chicago Belting Co., Chicago, Ill.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Continental Rubber Wks., Erie, Pa.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., The, Denver, Colo.
Horton Mfg. Co., Minneapolis, Minn.
Medart Co., St. Louis, Mo.
Remco Products Corp., York, Pa.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Rockwood Mfg. Co., Indianapolis, Ind.
Williams & Son, I. B., Dover, N. H.
Wood's Sons Co., T. B., Chambersburg, Pa.

## DRIVES, V BELT

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Browning Mfg. Co., Inc., Maysville, Ky.
Chicago Belting Co., Chicago, Ill.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Continental Rubber Wks., Erie, Pa.
Dayton Rubber Mfg. Co., Dayton, O.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., Denver, Colo.
Goldens' Foundry & Machine Co., Columbus, Ga.
Goodrich Co., B. F., Akron, O.
Horton Mfg. Co., Minneapolis, Minn.
Ideal Commutator Dresser Co., Sycamore, Ill.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Medart Co., St. Louis, Mo.
Pyott Foundry & Machine Co., Chicago, Ill.
Remco Products Corp., York, Pa.
Rockwood Mfg. Co., Indianapolis, Ind.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

## DRIVES, VARIABLE SPEED

*See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical; Reducers, Speed; Pulleys and Sheaves, for Belt Drives*

## DRYERS, INDUSTRIAL (COMPARTMENT, TUNNEL, CONVEYOR, VACUUM, SPRAY, ROTARY, ETC.)

Bowen Research Corp., Garwood, N. J.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Drying Systems, Inc., Chicago, Ill.
Hersey Mfg. Co., South Boston, Mass.
Hunter Machine Co., James, North Adams, Mass.
Instant Drying Corp., New York, N. Y.
Jeffrey Mfg. Co., Columbus, O.
● Link-Belt Co., Chicago, Ill.
Louisville Drying Machinery Co., Louisville, Ky.
Peters-Dalton, Inc., Detroit, Mich.
Proctor & Schwartz, Inc., Philadelphia, Pa.
Raymond Pulverizer Div., Combustion Engineering Co., Chicago, Ill.
Ross Engineering Corp., J. O., New York, N. Y.
Stokes Machine Co., F. J., Philadelphia, Pa.
● Sturtevant Co., B. F., Boston, Mass.
Western Precipitation Corp., Los Angeles, Calif.

## DUAL THERMOSTATS

*See Thermostats, Two Temperature or Dual*

## DUCT CONNECTIONS

*See Connections, Duct, Flexible; Connectors for Non-Metallic Duct Fabrication*

## DUCT HEATERS

*See Heaters, Duct*

## DUCT INSULATION

*See Insulation, Duct*

## DUCT THERMOSTATS

*See Thermostats, Duct Type*

## DUCT TURNING VANES

*See Vanes, Duct Turning, Prefabricated*

## DUCTS AND DUCT FITTINGS, PREFABRICATED, METALLIC

Acer & Whedon, Inc., Medina, N. Y.
Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Champion Furnace Pipe Co., Peoria, Ill.
Chandler Co., Cedar Rapids, Ia.
Char-Gale Mfg. Co., Minneapolis, Minn.
Chicago Furnace Supply Co., Chicago, Ill.
Chicago Metal Hose Corp., Maywood, Ill. (For aircraft)
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Corbman Bros., Inc., Philadelphia, Pa.
Excelsior Steel Furnace Co., Chicago, Ill.
Gehri Co., Tacoma, Wash.
General Heating Products Co., Minneapolis, Minn.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Gray Metal Products, Inc., Rochester, N. Y.
Henry Furnace Co., The, Medina, O.
Howes-Woods Co., Cambridge, Mass.
International Heater Co., Utica, N. Y.
Jacobs Co., B. & J., Cincinnati, O.
Lamneck Products, Inc., Middletown, O.
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Milwaukee, Wis.
Moncrief Furnace Co., Atlanta, Ga.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Schecter Brothers Co., Philadelphia, Pa.
Smith-Raymond Co., Columbus, Ga.
United States Register Co., Battle Creek, Mich.
Williamson Heater Co., Cincinnati, O.

## DUCTS AND DUCT FITTINGS, PREFABRICATED, NON-METALLIC

Carey Mfg. Co., Philip, Cincinnati, O.
du Pont de Nemours & Co., E. I., Fabrics & Finishes Dept., Wilmington, Del.
Dutton Asbestos & Supply Co., San Francisco, Calif.
Jacobs Co., B. & J., Cincinnati, O.
Knight, Maurice A., Akron, O. (acid fumes)
Smith-Raymond Co., Columbus, Ga.
United States Rubber Co., New York, N. Y.

## DUST COLLECTORS

*See Collectors, Dust*

## DUST COUNTERS

*See Counters, Dust*

## ECONOMIZERS, FUEL

Babcock & Wilcox Co., New York, N. Y.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Combustion Engineering Co., Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
Fuel Savers, Inc., Harrisburg, Pa.
Green Fuel Economizer Co., Beacon, N. Y.
Richmond Engineering Co., Inc., Richmond, Va.
● Sturtevant Co., B. F., Boston, Mass.
Zallea Brothers & Johnson, Wilmington, Del.

## EJECTORS, SEWAGE

American-Marsh Pumps, Inc., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Works Co., Columbus, O.
Economy Pumps, Inc., Hamilton, O.
● Nash Engineering Co., South Norwalk, Conn.
Penberthy Injector Co., Detroit, Mich.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Schutte & Koerting Co., Philadelphia, Pa.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Inc., Buffalo, N. Y.
Weil Pump Co., Chicago, Ill.
Yeomans Bros. Co., Chicago, Ill.

## ELECTRIC AIR CLEANERS

*See Cleaners, Air, Electrical*

## ELECTRIC DRILLS

*See Drills, Electric, Portable*

## ELECTRIC MOTORS

*See Motors, Electric*

## ELECTRIC SHEARS

*See Shears, Electric, Portable*

## ELECTRIC UNIT HEATERS

*See Heaters, Unit, Electric Heating Element*

## ELECTRIC WATER HEATERS

*See Heaters, Water, Electric*

## ELECTRODES, ARC WELDING

● Air Reduction Sales Co., New York, N. Y.
Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Allied Weld-Craft, Inc., Indianapolis, Ind.
Aluminum Co. of America, Pittsburgh, Pa.
American Agile Corp., Cleveland, O.
● American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland, O.
Arcos Corp., Philadelphia, Pa.
Atlantic Steel Co., Atlanta, Ga.
Carlin Co., Anthony, Cleveland, O.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Steel & Wire Co., Chicago, Ill.
Electric Arc., Inc., Newark, N. J.
Ergolyte Mfg. Co., Philadelphia, Pa.
Eutectic Welding Alloys Co., New York, N. Y.

● Advertisement in this issue. See Index to Advertisers, page 350.

- General Electric Co., Schenectady, N. Y.
- Harnischfeger Corp., Milwaukee, Wis.
- Hobart Bros. Co., Troy, O.
- Hollup Corp., Div. of National Cylinder Gas Co., Chicago, Ill.
- Laclede Steel Co., St. Louis, Mo.
- Lincoln Electric Co., Cleveland, O.
- Marquette Mfg. Co., Minneapolis, Minn.
- Maurath, Inc., Cleveland, O.
- McKay Co., York, Pa.
- Metal & Thermit Corp., New York, N. Y.
- National Carbon Co., New York, N. Y.
- National Cylinder Gas Co., Chicago, Ill.
- Page Steel & Wire Division of American Chain & Cable Co., Inc., Monessen, Pa.
- Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
- Universal Power Corp., Cleveland, O.
- Welding Apparatus Co., Chicago, Ill.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Wilson Welder & Metals Co., Inc., New York, N. Y.

## ELIMINATORS, AIR, FOR HEATING AND PIPING SYSTEMS

- ● Anderson Co., V. D., The, Cleveland, O.
- ● Armstrong Machine Works, Three Rivers, Mich.
- Beaton & Cadwell Mfg. Co., New Britain, Conn.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Burnham Boiler Corp., Irvington, N. Y.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● Dole Valve Co., The, Chicago, Ill.
- Gorton Heating Corp., Cranford, N. J.
- ● Hoffman Specialty Co , Indianapolis, Ind.
- ● Illinois Engineering Co., Chicago, Ill.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- Marsh Corp., Jas. P., Chicago, Ill.
- ● McAlear Mfg. Co., Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
- ● Sarco Co., Inc., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- ● Sterling, Inc., Milwaukee, Wis.
- Triplex Heating Specialty Co., Peru, Ind.
- Vapor Specialty Co., New York, N. Y.
- Wright-Austin Co., Detroit, Mich.

## ENAMELS AND LACQUERS

- Acme White Lead & Color Works, Detroit, Mich.
- Acorn Refining Co., Cleveland, O.
- American-Marietta Co., Chicago, Ill.
- Baer Bros., New York, N. Y.
- Blue Ridge Talc Co., Inc., Henry, Va.
- Cordo Chemical Co., Norwalk, Conn.
- Debevoise Co , The, Brooklyn, N. Y.
- Detroit Graphite Co., Detroit, Mich.
- Devoe & Raynolds Co., Inc., New York, N. Y.
- Dragert Co., Inc., C. H., Brooklyn, N. Y.
- du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.
- Ferro-Enamel Corp., Liquid Plastics Div., Cleveland, O.
- Glidden Co., Cleveland, O.
- Hague & Co., Inc., Alfred, Brooklyn, N. Y.
- Hilo Varnish Corp., Brooklyn, N. Y.
- Horn Co., A. C., Long Island City, N. Y.
- Inter-Coastal Paint Corp., East St. Louis, Ill.
- Krehbiel Co., J. H., Chicago, Ill.
- Maas & Waldstein Co., Newark, N. J.
- O'Brien Varnish Co., South Bend, Ind.
- Pittsburgh Plate Glass Co., Pittsburgh, Pa.
- Quigley Co., Inc., New York, N. Y.
- Roxalin Flexible Finishes, Inc., Elizabeth, N. J.
- Sanvin Chemical Products Co., Moline, Ill.
- Sherwin-Williams Co., The, Cleveland, O.
- Sonneborn Sons, Inc., L., New York, N. Y.
- Thompson & Co., Pittsburgh, Pa.
- Tropical Paint & Oil Co., Cleveland, O.
- U. S. Gutta Percha Paint Co., Providence, R. I.
- Wailes Dove-Hermiston Corp., Westfield, N. J.
- Wattenamel Co., Summit, Ill.
- Wilbur & Williams Co., Boston, Mass.
- Wilhelm Co., A., Reading, Pa.
- Zapon Div., Atlas Powder Co., North Chicago, Ill.

## ENGINES, DIESEL, FOR FAN, PUMP AND COMPRESSOR DRIVES

- American Locomotive Co., Auburn, N. Y.
- Anderson Engine & Foundry Co., Anderson, Ind.
- Baldwin De La Vergne Sales Corp., Philadelphia, Pa.
- Bardco Mfg. & Sales Co., Los Angeles, Calif.
- Buda Co., Harvey, Ill.
- Caterpillar Tractor Co., Peoria, Ill.
- Chicago Pneumatic Tool Co., New York, N. Y.
- Cooper-Bessemer Corp., The, Mt. Vernon, O.
- Fairbanks, Morse & Co., Chicago, Ill.
- General Motors Corp., Detroit, Mich.
- Hill Diesel Engine Co., Lansing, Mich.
- ● Ingersoll-Rand Co., New York, N. Y.
- Waukesha Motor Co., Waukesha, Wis.
- Witte Engine Works, Div. of Oil Well Supply Co., Kansas City, Mo.
- Worthington Pump & Machinery Corp., Harrison, N. J.

## ENGINES, GAS, FOR FAN, PUMP AND COMPRESSOR DRIVES

- Bardco Mfg. & Sales Co., Los Angeles, Calif.
- Buda Co., Harvey, Ill.
- Caterpillar Tractor Co., Peoria, Ill.
- Chicago Pneumatic Tool Co., New York, N. Y.
- Continental Motors Corp., Detroit, Mich
- Cooper-Bessemer Corp., The, Mt. Vernon, O.
- Fairbanks, Morse & Co., Chicago, Ill.
- ● Ingersoll-Rand Co., New York, N. Y.
- U. S. Motors Corp., Oshkosh, Wis.
- Universal Motor Co., Oshkosh, Wis.
- Waukesha Motor Co., Waukesha, Wis.
- Williamsport Engine & Machine Co., Williamsport, Pa
- Worthington Pump & Machinery Corp., Harrison, N. J.

## ENGINES, STEAM, FOR FAN, PUMP AND COMPRESSOR DRIVES

- Ames Iron Wks., Div. of Pierce, Butler Radiator Corp., Oswego, N. Y.
- Elliott Co., Jeannette, Pa.
- Frick Co., Waynesboro, Pa.
- Harrisburg Machinery Corp., Harrisburg, Pa.
- Morris Machine Wks., Baldwinsville, N. Y.
- Skinner Engine Co., Erie, Pa.
- ● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Troy Engine & Machine Co., Troy, Pa.
- Vilter Mfg. Co., Milwaukee, Wis.

## EQUIPMENT, BALANCING

- Bear Mfg. Co., Industrial Div., Rock Island, Ill.
- Gisholt Machine Co., Madison, Wis.

## EVAPORATIVE CONDENSERS

*See Condensers, Refrigerating, Evaporative*

## EXCHANGERS, HEAT

- Babcock & Wilcox Co., New York, N. Y.
- Beacon-Morris Corp., Boston, Mass.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Brown Fintube Co., The Elyria, O.
- Buffalo Tank Corp., Dunellen, N. J.
- ● Bush Mfg. Co., Hartford, Conn.
- Corning Glass Works, Corning, N. Y.
- Downingtown Iron Works, Downingtown, Pa.
- Foster Wheeler Corp., New York, N. Y.
- Frank Heaters, Inc., Paterson, N. J.
- Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
- Griscom-Russell Co., The, New York, N. Y.
- Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Ingersoll-Rand Co., New York, N. Y.
- Kellogg Co., M. W., The, New York, N. Y.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Koven & Bro., Inc., L. O., Jersey City, N. J.
- ● Kramer Trenton Co., Trenton, N. J.
- Larkin Coils, Inc., Atlanta, Ga.
- McQuay, Inc., Minneapolis, Minn.
- ● Modine Mfg. Co., Racine, Wis.
- ● Mueller Brass Co., Port Huron, Mich.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- National Carbon Co., New York, N. Y.
- National Radiator Co., The, Johnstown, Pa.
- Parker Appliance Co., The, Cleveland, O.
- Phillips Cooling Tower Co., Inc., New York, N. Y.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Sims Co., Erie, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Stout & Sons, David, St. Louis, Mo.
- Superior Valve & Fittings Co., Pittsburgh, Pa.
- Thermal Industries, Indio, Calif.
- ● Trane Co., The, LaCrosse, Wis.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- Waterfilm Boilers, Inc. Jersey City, N. J.
- ● Whitlock Mfg. Co., Hartford, Conn.
- ● Young Radiator Co., Racine, Wis.
- Zallea Brothers & Johnson, Wilmington, Del.

## EXCHANGERS, HEAT, REFRIGERANT SUCTION LINE

- ● Acme Industries, Inc., Jackson, Mich.
- Downingtown Iron Works, Downingtown, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Temprite Products Corp., Detroit, Mich.
- ● Trane Co., The, La Crosse, Wis.
- ● Young Radiator Co., Racine, Wis.
- Zallea Brothers & Johnson, Wilmington, Del.

## EXHAUST HEADS

*See Heads, Exhaust, for Pipe Lines*

## EXHAUSTERS, WELDING FUME

- Aladdin Heating Corp., Oakland, Calif.
- American Machine Products Co., Marshalltown, Ia.
- Belanger Fan & Blower Co., Detroit, Mich.

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Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Chicago Pneumatic Tool Co., New York, N. Y.
Coppus Engineering Corp., Worcester, Mass.
Day Co., The, Minneapolis, Minn.
Despatch Oven Co., Minneapolis, Minn.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
General Blower Co., Chicago, Ill.
Kirk & Blum Mfg. Co., Cincinnati, O.
Klee Co., Geo. B., Cincinnati, O.
Ruemelin Mfg. Co., Milwaukee, Wis.
Sawyer Electrical Mfg. Co., Los Angeles, Calif.
Torit Mfg. Co., St. Paul, Minn.
Utility Appliance Corp., Los Angeles, Calif.
● Westinghouse Electric & Mfg. Co., Cleveland, O.
Whiting Corp., Harvey, Ill.
Wind-Way Fan & Ventilator Co., New Orleans, La.

## EXPANSION BENDS

*See Bends, Expansion*

## EXPANSION BOLTS

*See Bolts, Expansion*

## EXPANSION JOINTS

*See Joints, Pipe, Expansion*

## EXPANSION TANKS

*See Tanks, Expansion, for Hot Water Heating Systems*

## EXPANSION VALVES

*See Valves, Refrigeration*

## EXTRACTORS, PIPE

Kopperman & Sons, Joseph, Philadelphia, Pa.
Reps Tool Co., Inc., New York, N. Y.
● Ridge Tool Co., Elyria, O.
● Sturtevant Co., B. F., Boston, Mass.

## FABRICATED PIPING

*See Bends; Headers; Joints, etc.*

## FABRICATORS, PIPE

*See Headers, Welded; and Coils, Pipe*

## FAN BALANCING EQUIPMENT

*See Equipment, Balancing*

## FAN BASES

*See Bases and Pads, Vibration Isolating*

## FAN BLADES

*See Blades, Propeller Fan*

## FAN HOUSINGS

*See Housings, Fan, Centrifugal*

## FANS, AXIAL FLOW, PRESSURE TYPE

Bahnson Co., Winston-Salem, N. C.
● Buffalo Forge Co., Buffalo, N. Y.
● Caldwell Co., Wm. J., Washington, D. C.
● Chelsea Fan & Blower Co., Inc., Irvington, N. J.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Engineering, Inc., Dayton, O.
● La-Del Conveyor Co., New Philadelphia, O.
Propellair, Inc., Springfield, O.
South Bend Air Products Corp., South Bend, Ind.
● Sturtevant Co., B. F., Boston, Mass.
● Wing Mfg. Co., L. J., New York, N. Y.

## FANS, CENTRIFUGAL

Advance Aluminum Castings Corp., Chicago, Ill.
Advance Fan & Blower Co., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Air Controls, Inc., Cleveland, O.
● Airtherm Mfg. Co., St. Louis, Mo.
Aladdin Heating Corp., Oakland, Calif.
● Allen Corp., Detroit, Mich.
American Blower Corp., Detroit, Mich.
American Foundry & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Ames Co., W. R., San Francisco, Calif.
Ballantyne Co., Omaha, Nebr.
Bayley Blower Co., Milwaukee, Wis.
Beckett & Co., Thomas, Dallas, Tex.
Bern's Specialty Mfg. Co., Chicago, Ill.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blower Application Co., Milwaukee, Wis.
Brundage Co., The, Kalamazoo, Mich.
● Buffalo Forge Co., Buffalo, N. Y.
● Caldwell Co., Wm. J., Washington, D. C.
Campbell Heating Co., Des Moines, Ia.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
Century Fan & Ventilator Co., New York, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
● Clarage Fan Co., Kalamazoo, Mich.
Coppus Engineering Corp., Worcester, Mass.
Day Co., The, Minneapolis, Minn.
Despatch Oven Co., Minneapolis, Minn.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Essick Mfg. Co., Los Angeles, Calif.
Garden City Fan Co., Chicago, Ill.
● General Blower Co., Inc., Philadelphia, Pa.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
● Grand Rapids Die & Tool Co., Grand Rapids, Mich.
Hastings Air Conditioning Co., Hastings, Nebr.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Sales Co., San Francisco, Calif.
Jackson & Church Co., Saginaw, Mich.
Jaden Mfg. Co., Hastings, Nebr.
Jeffrey Mfg. Co., Columbus, O.
Johnson Fan & Blower Corp., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
L-R Mfg. Co., Blower Div., Torrington, Conn.
● Lau Blower Co., Dayton, O.
Lehigh Fan & Blower Co., Allentown, Pa
Leinweber Fan & Blower Co., Chicago, Ill.
Magirl Foundry & Furnace Works, P. H., Bloomington, Ill.
Martin Fan & Blower Co., Chicago, Ill.
Montag Stove & Furnace Wks., Portland, Ore.
Morrison Products, Inc., Cleveland, O.
Mountain States Equipment Co., Denver, Colo.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
National Engineering & Mfg. Co., Kansas City, Mo.
National Mfg. & Engineering Co., Detroit, Mich.
● Nelson Corp., Herman, Moline, Ill.
New York Blower Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
Northern Blower Co., Cleveland, O.
Northwest Foundry & Furnace Co., Portland, Ore.
● Palmer Mfg. Corp., Phoenix, Ariz.
● Peerless Electric Co., Warren, O.
Phelps Mfg. Co., Little Rock, Ark.
Prat-Daniel Corp., Port Chester, N. Y.
Reynolds Mfg. Co., The, Grand Rapids, Mich.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Schwitzer-Cummins Co., Indianapolis, Ind.
Semco Mfg. Co., Nashville, Tenn.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
● Sturtevant Co., B. F., Boston, Mass.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Viking Air Conditioning Corp., Cleveland, O.
Western Blower Co., Seattle, Wash.
● Wing Mfg. Co., L. J., New York, N. Y.

## FANS, PROPELLER

Aerovent Fan Co, Piqua, O.
Air Controls, Inc., Cleveland, O.
Aire-Foile Fan & Blower Co., Detroit, Mich.
Airmaster Corp., Chicago, Ill.
● Airtherm Mfg. Co., St. Louis, Mo.
● Allen Corp., Detroit, Mich.
American Blower Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
Arex Co., Chicago, Ill.
Bahnson Co., Winston-Salem, N. C.
Bayley Blower Co., Milwaukee, Wis.
Beckett & Co., Thomas, Dallas, Tex.
Belanger Fan & Blower Co., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Bern's Specialty Mfg. Co., Chicago, Ill.
Bishop & Babcock Mfg. Co., Cleveland, O.
● Buffalo Forge Co., Buffalo, N. Y.
C & H Air Conditioning Fan Co., Inc., Atlanta, Ga.
● Caldwell Co., Wm. J., Washington, D. C.
Campbell Heating Co., E. K., Kansas City, Mo.
Century Fan & Ventilator Co., New York, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Circulators & Devices Mfg. Corp., New York, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Coppus Engineering Corp., Worcester, Mass.
Dallas Engineering Co., Inc., Dallas, Tex.
De Bothezat Fans Div., American Machine & Metals, Inc., New York, N. Y.
Diehl Mfg. Co., Somerville, N. J.
Dual Air Fan Co., Chicago, Ill.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fresh'nd-Aire Co., Chicago, Ill.
Garden City Fan Co., Chicago, Ill.
Gehri Co., Tacoma, Wash.
● General Blower Co., Inc., Philadelphia, Pa.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Guth Co., Edwin F., St. Louis, Mo.

● Advertisement in this issue. See Index to Advertisers, page 350.

Hartzell Propeller Fan Co., Piqua, O.
Hirschman Co., W. F., Buffalo, N. Y.
Holtum Mfg. Co., Freeport, Ill.
Hunter Fan & Ventilating Co., Inc., Memphis, Tenn.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Engineering, Inc., Dayton, O.
Jamieson Mfg. Co., Dallas, Tex.
Jeffrey Mfg. Co., Columbus, O.
Johnson Fan & Blower Corp., Chicago, Ill.
Johnston Co., William W., Dayton, O.
Jordan & Co., Paul R., Indianapolis, Ind.
King Ventilating Co., Owatonna, Minn.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Klee Co., Geo. B., Cincinnati, O.
● La-Del Conveyor & Mfg. Co., New Philadelphia, O.
● Lau Blower Co., Dayton, O.
Marathon Electric Mfg. Corp., Wausau, Wis.
● McCord Corp., Detroit, Mich.
Meier Electric & Machine Co., Indianapolis, Ind.
Mountain States Equipment Co., Denver, Colo.
Myers Electric Co., Inc., Pittsburgh, Pa.
National Engineering & Mfg. Co., Kansas City, Mo.
● Nelson Corp., Herman, Moline, Ill.
New York Blower Co., Chicago, Ill.
● Peerless Electric Co., Warren, O. (Disc)
Perkins & Son, Inc., B. F., Holyoke, Mass.
Phelps Mfg. Co., Little Rock, Ark.
Pritchard & Co., J. F., Kansas City, Mo.
Propellair, Inc., Springfield, O.
Reed Unit-Fans, Inc., New Orleans, La.
Reynolds Electric Co., Chicago, Ill.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Schwitzer-Cummins Co., Indianapolis, Ind.
Scott-Newcomb, Inc., St. Louis, Mo.
Semco Mfg. Co., Nashville, Tenn.
Shreveport Engineering Co., Inc., Shreveport, La.
Signal Electric Mfg. Co., Menominee, Mich.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
South Bend Air Products Corp., South Bend, Ind.
● Sturtevant Co., B. F., Boston, Mass.
Thermal Industries, Indio, Calif.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
Truflo Fan Co., Harmony, Pa.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.
Viking Air Conditioning Corp., Cleveland, O.
Water Cooling Equipment Corp., St. Louis, Mo.
Western Blower Co., Seattle, Wash.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Wind-Way Fan & Ventilator Co., New Orleans, La.
● Wing Mfg. Co., L. J., New York, N. Y.

## FEEDERS, CHEMICAL, PROPORTIONING

American Water Softener Co., Philadelphia, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Elgin Softener Corp., Elgin, Ill.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Haering Co., Inc., D. W., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
% Proportioneers, Inc. %, Providence, R. I.
Permutit Co., New York, N. Y.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Syntron Co., Homer City, Pa.
Wade Mfg. Co., Elgin, Ill.
Wallace & Tiernan Co., Inc., Newark, N. J.

## FEEDERS, WATER, HEATING BOILER

Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.
Davis Regulator Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
● General Controls Co., Glendale, Cal.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kisco Boiler & Engineering Co., St. Louis, Mo.
● Maid-O'-Mist, Inc., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Nason Co., Detroit, Mich.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
Templeton Mfg. Co., Hyde Park, Mass.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

## FEEDWATER HEATERS

*See Deaerators*

## FIBER PACKING

*See Packing, Fiber*

## FIBER PIPE

*See Pipe, Fiber*

## FILTER GAGES

*See Gages, Air Filter*

## FILTERS, AIR, AUTOMATIC

● Air & Refrigeration Corp., New York, N. Y.
Air-Stream Filter Corp., St. Louis, Mo.
● American Air Filter Co., Inc., Louisville, Ky.
Brauer Supply Co., A. G., St. Louis, Mo.
● Dollinger Corp., Rochester, N. Y.
Dracco Corp., Cleveland, O.
Farr Co., Los Angeles, Calif.

## FILTERS, AIR, UNIT, CLEANABLE

Air Devices, Inc., New York, N. Y.
Air Filter Engineering Co., Chicago, Ill.
● Air-Maze Corp., Cleveland, O.
Air-Stream Filter Corp., St. Louis, Mo.
● American Air Filter Co., Inc., Louisville, Ky.
Amirton Co., Inc., New York, N. Y.
Badger Corp., Milwaukee, Wis.
Brauer Supply Co., A. G., St. Louis, Mo.
Chicago Filter Co., Joliet, Ill.
Coppus Engineering Corp., Worcester, Mass.
● Detroit Lubricator Co., Detroit, Mich.
● Dollinger Corp., Rochester, N. Y.
Farr Co., Los Angeles, Calif.
Filters, Inc., Glendale, Calif.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kaye & MacDonald, Inc., West Orange, N. J.
Kleenaire Corp., Stevens Point, Wis.
● Research Products Corp., Madison, Wis.
Somers, Inc., H. J., Detroit, Mich.
Supreme Air Filter Co., New York, N. Y.
Universal Air Filter Corp., Duluth, Minn.

## FILTERS, AIR, UNIT, THROW-AWAY

● American Air Filter Co., Inc., Louisville, Ky.
Amirton Co., Inc., New York, N. Y.
Arcweld Mfg. Co., Inc., Seattle, Wash.
Badger Corp., Milwaukee, Wis.
Beckett & Co., Thomas, Dallas, Tex.
Blocksom & Co., Michigan City, Ind.
Chicago Filter Co., Joliet, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Dollinger Corp., Rochester, N. Y.
Gehri Co., Tacoma, Wash.
Kleenaire Corp., Stevens Point, Wis.
● Owens-Corning Fiberglas Corp., Toledo, O.
● Research Products Corp., Madison, Wis.
Universal Air Filter Corp., Duluth, Minn.
Wilson & Co., Chicago, Ill.

## FILTERS, ODOR

*See Adsorbers, Odor*

## FILTERS, PIPE LINE

Adams Co., Inc., R. P., Buffalo, N. Y.
● Alco Valve Co., St. Louis, Mo.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
Bowser, Inc., Fort Wayne, Ind.
Cleveland Humidifier Co., Cleveland, O.
Cochrane Corp., Philadelphia, Pa.
Cuno Engineering Corp., Meriden, Conn.
● Dollinger Corp., Rochester, N. Y.
Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
● Fisher Governor Co., Marshalltown, Ia.
● General Motors Corp., Moraine Products Div., Dayton, O.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Hotstream Heater Co., Cleveland, O. (air)
Imperial Brass Mfg. Co., Chicago, Ill. (Refrigerant)
Johnson Corp., Three Rivers, Mich.
Logan Engineering Co., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Newark Wire Cloth Co., Newark, N. J.
Norgren Co., C. A., Denver, Colo.
Permutit Co., New York, N. Y.
Refinite Corp., Omaha, Neb.
Rega Mfg. Co., Rochester, N. Y.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Scientific Instrument Co., Detroit, Mich.
Trerice Co., Detroit, Mich.
Weatherhead Co., Cleveland, O.
Worthington Pump & Machinery Corp., Harrison, N. J.

## FINNED TUBING

*See Tubing, Finned*

## FIRE PUMPS

*See Pumps, Fire*

## FITTINGS, BLOW PIPE

Allington & Curtis Mfg. Co., Saginaw, Mich.
Chicago Metal Mfg. Co., Chicago, Ill.
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Day Co., The, Minneapolis, Minn.
Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
Mahon Co., R. C., Detroit, Mich.
National Metal Fabricators, Chicago, Ill.

Northern Blower Co., Cleveland, O.
Peters-Dalton, Inc., Detroit, Mich.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Schmieg Industries, Detroit, Mich.
• Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Tiffin Eaves Trough Clamp Co., Tiffin, O.
United States Register Co., Battle Creek, Mich.
Western Blower Co., Seattle, Wash.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
Young & Bertke Co., Cincinnati, O.

## FITTINGS, COPPER TUBE, COMPRESSION AND FLARED

• American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
• Crane Co., Chicago, Ill.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Everhot Products Co., Chicago, Ill.
• Grinnell Co., Inc., Providence, R. I.
Hays Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Packless Metal Products Corp., New Rochelle, N. Y. (Self-flaring)
Parker Appliance Co., Cleveland, O.

## FITTINGS, COPPER TUBE, SOLDER

Acheson Mfg. Co., Rankin, Pa.
• American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
• Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Grabler Mfg. Co., Cleveland, O.
• Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Union Metal Works, Chelsea, Mass.
• Walworth Co., New York, N. Y. (Brazed)

## FITTINGS, DRAINAGE, FIXED AIR BREAK

American Sterilizer Co., Erie, Pa.
• Crane Co., Chicago, Ill.
Scanlan-Morris Co., Madison, Wis.
Semler Co., Jeannette, Pa.
Wade Mfg. Co., Elgin, Ill.

## FITTINGS, HOT WATER HEATING SYSTEMS, ONE PIPE

• Bell & Gossett Co., Morton Grove, Ill.
Kehm Corp., The, Chicago, Ill.
Semler Co., Jeannette, Pa.
Taco Heaters, Inc., New York, N. Y.
• Thrush & Co., H. A., Peru, Ind.
• Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.

## FITTINGS, LINED

American Hard Rubber Co., New York, N. Y. (Rubber)
American Smelting & Refining Co., New York, N. Y.
Cement Lined Pipe Co., Lynn, Mass.
Goodrich Co., B. F., Akron, O. (Rubber)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead and tin)
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Michigan Pipe Co., Bay City, Mich.
National Lead Co., New York, N. Y. (Lead)
Northern Indiana Brass Co., Elkhart, Ind. (Tinned)
Resisto Pipe & Valve Co., East Cambridge, Mass.
United States Rubber Co., New York, N. Y. (Rubber)

## FITTINGS, PIPE, BRASS, SOLDER

Acheson Mfg. Co., Rankin, Pa.
• American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
• Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
• Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Parker Appliance Co., Cleveland, O.
Union Metal Works, Chelsea, Mass.
• Walworth Co., New York, N. Y. (Brazed)

## FITTINGS, PIPE, BRASS, THREADED

Acheson Mfg. Co., Rankin, Pa.
American Manganese Bronze Co., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Bowser, Inc., Fort Wayne, Ind.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
• Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Grabler Mfg. Co., Cleveland, O.
• Grinnell Co., Inc., Providence, R. I.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
• Kennedy Valve Mfg. Co., Elmira, N. Y.
Leavitt Machine Co., Orange, Mass.
Lunkenheimer Co., Cincinnati, O.
Newman Brothers, Inc., Cincinnati, O.
New York Brass Fdry., New York, N. Y.
Parker Appliance Co., Cleveland, O.
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
Phoenix Brass Fittings Corp., Irvington, N. J.
Ross Sprinkler Co., Pasadena, Calif.
Union Metal Wks., Chelsea, Mass.
• Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

## FITTINGS, PIPE, BRASS, WELDING

• Bonney Forge & Tool Wks., Allentown, Pa.
• Midwest Piping & Supply Co., Inc., St. Louis, Mo.
• Tube Turns, Louisville, Ky.
• Walworth Co., New York, N. Y. (Brazed)

## FITTINGS, PIPE, BRONZE, BRAZED

• Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Newman Brothers, Inc., Cincinnati, O.
Union Metal Works, Chelsea, Mass.
• Walworth Co., New York, N. Y.

## FITTINGS, PIPE, CAST IRON, FLANGED

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
• Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
• Crane Co., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Eastern Foundry Co., Boyertown, Pa.
Frick Co., Waynesboro, Pa.
Goodrich Co., B. F., Akron, O.
• Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
• Kennedy Valve Mfg. Co., The, Elmira, N. Y.
• Kuhns Bros. Co., Dayton, O.
Lynchburg Foundry Co., Lynchburg, Va.
Malleable Iron Fittings Co., Branford, Conn.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Semler Co., Jeannette, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
United States Pipe & Foundry Co., Burlington, N. J.
• Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

## FITTINGS, PIPE, CAST IRON, THREADED

Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
• Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Eastern Foundry Co., Boyertown, Pa.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Frick Co., Waynesboro, Pa.
Grabler Mfg. Co., Cleveland, O.
• Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
• Kuhns Bros. Co., Dayton, O.
Malleable Iron Fittings Co., Branford, Conn.
Ravena Iron Co., Ravena, N. Y.
Semler Co., Jeannette, Pa.
Somerville Iron Works, Somerville, N. J.
Stockham Pipe Fittings Co., Birmingham, Ala.
• Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

## FITTINGS, PIPE, COMPRESSION

• Crane Co., Chicago, Ill.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Hays Mfg. Co., Erie, Pa.

## FITTINGS, PIPE, HARD RUBBER

American Hard Rubber Co., New York, N. Y.
Goodrich Co., B. F., Akron, O.
Luzerne Rubber Co., Trenton, N. J.

## FITTINGS, PIPE, LEAD

Alpha Metals, Inc., Brooklyn, N. Y.
American Smelting & Refining Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Lead Lined Iron Pipe Co., Wakefield, Mass.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.

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## FITTINGS, PIPE, MALLEABLE

- ● Crane Co., Chicago, Ill.
- Detroit Brass & Malleable Wks., Detroit, Mich.
- Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
- Grabler Mfg. Co., Cleveland, O.
- ● Grinnell Co., Inc., Providence, R. I.
- Illinois Malleable Iron Co., Chicago, Ill.
- Jarecki Mfg. Co., Erie, Pa.
- ● Kennedy Valve Mfg. Co., Elmira, N. Y.
- Malleable Iron Fittings Co., Branford, Conn.
- Pittsburgh Valve & Fittings Corp., Barberton, O.
- Rhode Island Fittings Co., Hillsgrove, R. I.
- Stockham Pipe Fittings Co., Birmingham, Ala.
- Victaulic Co. of America, New York, N. Y.
- ● Walworth Co., New York, N. Y.
- Ward Foundries, Inc., J. P., Blossburgh, Pa.

## FITTINGS, PIPE, NICKEL AND NICKEL ALLOY

- American Manganese Bronze Co., Philadelphia, Pa.
- Cooper Alloy Foundry Co., Hillside, N. J.
- ● Crane Co., Chicago, Ill.
- Duriron Co., Inc., Dayton, O.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- International Nickel Co., New York, N. Y.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Parker Appliance Co., Cleveland, O.
- ● Tube Turns, Louisville, Ky.
- Warren Foundry & Pipe Corp., New York, N. Y.

## FITTINGS, PIPE, PLASTIC

- Acadia Synthetic Products Div., Western Felt Works, Chicago Ill.
- American Hard Rubber Co., New York, N. Y.
- Commercial Plastics Co., Chicago, Ill.
- Commonwealth Products Co., Philadelphia, Pa.
- Hodgman Rubber Co., Framingham, Mass.
- Mills Corp., Elmer E., Chicago, Ill.
- North Penn Co., New York, N. Y.
- Parker Appliance Co., The Cleveland, O.
- United States Stoneware Co., New York, N. Y.
- Yardley Plastics Co., Columbus, O.

## FITTINGS, PIPE, STEEL, FLANGED

- Alloy Steel Products Co., Linden, N. J. (Stainless steel)
- ● American Rolling Mill Co., The, Middletown, O.
- ● Crane Co., Chicago, Ill.
- Frick Co., Waynesboro, Pa.
- Goodrich Co., B. F., Akron, O.
- Hasco Valve & Machine Co., Milwaukee, Wis. (Stainless steel only)
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Pipe and Tube Products, Inc., Jersey City, N. J.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Semet-Solvay Engrg. Corp., New York, N. Y.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.

## FITTINGS, PIPE, STEEL, FORGED, THREADED

- Catawissa Valve & Fittings Co., Catawissa, Pa.
- ● Crane Co., Chicago, Ill.
- Henry Valve Co., Chicago, Ill.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Larkin Packer Co., St. Louis, Mo.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.

## FITTINGS, PIPE, STEEL, SOCKET WELD

- Catawissa Valve & Fittings Co., Catawissa, Pa.
- ● Crane Co., Chicago, Ill.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.

## FITTINGS, PIPE, STEEL, THREADED

- Alloy Steel Products Co., Linden, N. J. (Stainless steel)
- Catawissa Valve & Fittings Co., Catawissa, Pa.
- Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
- ● Crane Co., Chicago, Ill.
- Frick Co., Waynesboro, Pa.
- Gustin Bacon Mfg. Co., Kansas City, Mo.
- Harrisburg Steel Corp., Harrisburg, Pa.
- Hasco Valve & Machine Co., Milwaukee, Wis. (Stainless steel only)
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.
- Wedge Protectors, Inc., Cleveland, O.

## FITTINGS, PIPE, STEEL, WELDING

- ● American Rolling Mill Co., The, Middletown, O.
- ● Bonney Forge & Tool Wks., Allentown, Pa.
- Catawissa Valve & Fittings Co., Catawissa, Pa.
- ● Crane Co., Chicago, Ill.
- ● Grinnell Co., Inc., Providence, R. I.
- Gustin Bacon Mfg. Co., Kansas City, Mo.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Larkin Packer Co., St. Louis, Mo.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Oil Well Supply Co., Oil City, Pa.
- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
- ● Reading-Pratt & Cady Div., American Chain & Cable Reading, Pa.
- Semet-Solvay Engineering Corp., New York, N. Y.
- ● Taylor Forge & Pipe Wks., Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Wedge Protectors, Inc., Cleveland, O. (Chill rings)

## FITTINGS, PIPE, WROUGHT IRON, WELDING

- ● Bonney Forge & Tool Wks., Allentown, Pa.
- ● Grinnell Co., Inc., Providence, R. I.
- Gustin Bacon Mfg. Co., Kansas City, Mo.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- ● Taylor Forge & Pipe Wks., Chicago, Ill.
- ● Tube Turns, Louisville, Ky.

## FITTINGS, REFRIGERATION

- ● Aeroquip Corp., Jackson, Mich.
- American Injector Co., Detroit, Mich.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- Chase Brass & Copper Co., Waterbury, Conn.
- Commonwealth Brass Corp., Detroit, Mich.
- ● Crane Co., Chicago, Ill.
- Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
- Downs-Smith Brass & Copper Co., New York, N. Y.
- Frick Co., Waynesboro, Pa.
- Hays Mfg. Co., Erie, Pa.
- Henry Valve Co., Chicago, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- ● Mueller Brass Co., Port Huron, Mich.
- Northern Indiana Brass Co., Elkhart, Ind.
- Parker Appliance Co., Cleveland, O.
- Superior Valve & Fittings Co., Pittsburgh, Pa.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.
- Weatherhead Co., Cleveland, O.
- Wittenmeier Machinery Co., Chicago, Ill.
- Worthington Pump & Machinery Corp., Air Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Inc., Chicago, Ill.
- ● York Corp., York, Pa.

## FLANGE BOLTS

*See Bolts and Studs, Flange*

## FLANGES, PIPE, ALLOY STEEL, LAP JOINT

- Cooper Alloy Foundry Co., Hillside, N. J.
- ● Crane Co., Chicago, Ill.
- Harrisburg Steel Corp., Harrisburg, Pa.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Limbert & Co., Geo. B., Chicago, Ill.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Pennsylvania Forge Co., Philadelphia, Pa.
- Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
- Semet-Solvay Engineering Corp., New York, N. Y.
- ● Taylor Forge & Pipe Works, Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- ● Walworth Co., New York, N. Y.

## FLANGES, PIPE, ALLOY STEEL, SCREWED

- Alloy Steel Products Co., Linden, N. J.
- Cooper Alloy Foundry Co., Hillside, N. J.
- ● Crane Co., Chicago, Ill.
- Harrisburg Steel Corp., Harrisburg, Pa.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- International Nickel Co., Inc., The, New York, N. Y and nickel alloy)
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Limbert & Co., Geo. B., Chicago, Ill.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Pennsylvania Forge Co., Philadelphia, Pa.
- Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
- Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
- ● Taylor Forge & Pipe Works, Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- ● Walworth Co., New York, N. Y.

## FLANGES, PIPE, ALLOY STEEL, WELDING

- Cooper Alloy Foundry Co., Hillside, N. J.
- ● Crane Co., Chicago, Ill.
- Harrisburg Steel Corp., Harrisburg, Pa.

● Advertisement in this issue. See Index to Advertisers, page 350.

Hasco Valve & Machine Co., Milwaukee, Wis.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Limbert & Co., Geo. B., Chicago, Ill.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pennsylvania Forge Co., Philadelphia, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., New York, N. Y.
● Taylor Forge & Pipe Works, Chicago, Ill.
● Tube Turns, Louisville, Ky.
● Walworth Co., New York, N. Y.

## FLANGES, PIPE, BRASS, SCREWED

Acheson Mfg. Co., Rankin, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
Kopperman & Sons, Joseph, Philadelphia, Pa.
National Valve & Mfg. Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Union Metal Works, Chelsea, Mass.
● Walworth Co., New York, N. Y.

## FLANGES, PIPE, CAST IRON, SCREWED

Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
● Kuhns Bros. Co., Dayton, O.
Limbert & Co., Geo. B., Chicago, Ill.
Lynchburg Foundry Co., Lynchburg, Va.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Ravena Iron Co., Ravena, N. Y.
Semler Co., Jeannette, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Straight Line Foundry & Machine Corp., Direct Separator Div., Syracuse, N. Y.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Warren Foundry & Pipe Corp., New York, N. Y.

## FLANGES, PIPE, MALLEABLE IRON, SCREWED

● Baker Ice Machine Co., Inc., Omaha, Nebr.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
National Valve & Mfg. Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Rhode Island Fittings Co., Hillsgrove, R. I.
● Walworth Co., New York, N. Y.

## FLANGES, PIPE, STEEL, LAP JOINT

● Crane Co., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
Harrisburg Steel Corp., Harrisburg, Pa.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Limbert & Co., Geo. B., Chicago, Ill.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pennsylvania Forge Co., Philadelphia, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., New York, N. Y.
● Taylor Forge & Pipe Works, Chicago, Ill.
● Tube Turns, Louisville, Ky.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.

## FLANGES, PIPE, STEEL, SCREWED

● Crane Co., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
Harrisburg Steel Corp., Harrisburg, Pa.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Limbert & Co., Geo. B., Chicago, Ill.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pennsylvania Forge Co., Philadelphia, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
● Taylor Forge & Pipe Works, Chicago, Ill.
● Tube Turns, Louisville, Ky.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.

## FLANGES, PIPE, STEEL, WELDING

● American Rolling Mill Co., The Middletown, O.
● Crane Co., Chicago, Ill.
● Flori Pipe Co., The, St. Louis, Mo.
● Grinnell Co., Inc., Providence, R. I.
Harrisburg Steel Corp., Harrisburg, Pa.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Limbert & Co., Geo. B., Chicago, Ill.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Naylor Pipe Co., Chicago, Ill.
Pennsylvania Forge Co., Philadelphia, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
Roessing Mfg. Co., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., New York, N. Y.
● Taylor Forge & Pipe Works, Chicago, Ill.
● Tube Turns, Louisville, Ky.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.

## FLARING TOOLS FOR TUBING

*See Tools, Flaring*

## FLEXIBLE COUPLINGS

*See Couplings, Flexible*

## FLEXIBLE DUCT CONNECTIONS

*See Connections, Duct Flexible*

## FLEXIBLE METAL HOSE

*See Hose, Metal and Fittings*

## FLOAT SWITCHES

*See Switches, Float*

## FLOAT VALVES

*See Valves, Float*

## FLOATS, STEAM TRAP, ETC.

Clark Controller Co., Cleveland, O.
● Crane Co., Chicago, Ill.
Cryer Trap & Valve Co., Inc., New York, N. Y.
Hanlon-Waters, Tulsa, Okla.
Harris & Co., Arthur, Chicago, Ill.
Hercules Float Wks., Springfield, Mass.
● Hoffman Specialty Co., Indianapolis, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Kieley & Mueller, Inc., North Bergen, N. J.
● McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Naugatuck Mfg. Co., Union City, Conn.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Reichert Float & Mfg. Co., Toledo, O.
Reliance Gauge Column Co., Cleveland, O.
Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
Strong, Carlisle & Hammond Co., Cleveland, O.
Templeton Mfg. Co., Hyde Park, Mass.
● Trane Co., The, La Crosse, Wis.
Vapor Specialty Co., New York, N. Y.
Watson & McDaniel Co., Philadelphia, Pa.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

## FLOOR AND CEILING PLATES

*See Plates, Floor and Ceiling*

## FLOW CONTROL VALVES

*See Valves, Flow Control*

## FLOW METERS

*See Meters, Flow*

## FLOW SWITCHES

*See Switches, Flow*

## FORGED STEEL VALVES

*See Valves, Forged Steel*

## FRESHENERS, AIR

*See Adsorbers, Odor*

## FUEL ECONOMIZERS

*See Economizers, Fuel*

## FURNACES, WARM AIR, FOR INDUSTRIAL AND LARGE BUILDING HEATING

● Airtherm Mfg. Co., St. Louis, Mo.
American Foundry & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Arcweld Mfg. Co., Inc., Seattle, Wash.
Beck Engineering Combustion Kompany, St. Louis, Mo.
● Bryant Heater Co., The, Cleveland, O.
Campbell Heating Co., Des Moines, Ia.
Campbell Heating Co., E. K., Kansas City, Mo.
Henry Furnace Co., The, Medina, O.
International Sales Co., San Francisco, Calif.
Jackson & Church Co., Saginaw, Mich.
Lee Engineering Co., Youngstown, O.
Lennox Furnace Co., Marshalltown, Ia., Syracuse, N. Y., and Columbus, O.
Magirl Foundry & Furnace Wks., P. H., Bloomington, Ill.
Majestic Co., Huntington, Ind.
Mayflower Air-Conditioners, Inc., St. Paul, Minn.
McCann Furnace Co., Cleveland, O.
McPherson Furnace & Supply Co., Portland, Ore.
Meyer Furnace Co., The, Peoria, Ill.
Moncrief Furnace Co., Atlanta, Ga.
Montag Stove & Furnace Wks., Portland, Ore.
● Mueller Furnace Co., L. J., Milwaukee, Wis.

● Advertisement in this issue. See Index to Advertisers, page 350.

- ● National Heater Co., Minneapolis, Minn.
- National Mfg. & Engineering Co., Detroit, Mich.
- Northwest Foundry & Furnace Co., Portland, Ore.
- ● Palmer Mfg. Corp., Phoenix, Ariz.
- Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
- Rosebraugn Co., W. W., Salem, Ore.
- Sonner Burner Co., Winfield, Kans.
- Stainless & Steel Products Co., St. Paul, Minn.
- ● Surface Combustion, Toledo, O.
- XXth Century Heating & Ventilating Co., Akron, O.
- Western Furnaces, Inc., Tacoma, Wash.
- Williamson Heater Co., Cincinnati, O.

## FUSIBLE LINKS

*See Links, Fusible*

## GAGE GLASSES

*See Glasses, Gage*

## GAGE TESTERS

*See Testers, Gage, Dead Weight*

## GAGES, AIR FILTER

- Air Filter Engineering Co., Chicago, Ill.
- Defender Instrument and Regulator Co., St. Louis, Mo.
- Dwyer Mfg. Co., F. W., Chicago, Ill.
- Ellison Draft Gage Co., Chicago, Ill.
- ● Hays Corp., Michigan City, Ind.
- Herbusch Corp., The, St. Louis, Mo. (Warning device)
- Hill, E. Vernon, Chicago, Ill.
- Hotstream Heater Co., Cleveland, O.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Meriam Instrument Co., The, Cleveland, O.
- Uehling Instrument Co., Paterson, N. J.

## GAGES, INDICATING, DRAFT

- Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Bailey Meter Co., Cleveland, O.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- Cole-Sullivan Engineering Co., Minneapolis, Minn.
- Defender Instrument and Regulator Co., St. Louis, Mo.
- Dwyer Mfg. Co., F. W., Chicago, Ill.
- Eimer & Amend, New York, N. Y.
- Ellison Draft Gage Co., Chicago, Ill.
- Foxboro Co., Foxboro, Mass.
- ● Hays Corp., Michigan City, Ind.
- Hill, E. Vernon, Chicago, Ill.
- Hotstream Heater Co., Cleveland, O.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Meriam Instrument Co., The, Cleveland, O.
- Moeller Instrument Co., Richmond Hill, N. Y.
- Precision Scientific Co., Chicago, Ill.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Republic Flow Meters Co., Chicago, Ill.
- Scientific Instrument Co., Detroit, Mich.
- Uehling Instrument Co., Paterson, N. J.

## GAGES, INDICATING, PRESSURE

- Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- Ashton Valve Co., Cambridge, Mass.
- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Bailey Meter Co., Cleveland, O.
- Belfield Co., H., Philadelphia, Pa.
- Bristol Co., Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- Certified Gauge & Instrument Corp., Long Island City, N. Y.
- Defender Instrument and Regulator Co., St. Louis, Mo.
- Detroit Brass & Malleable Wks., Detroit, Mich.
- ● Dole Valve Co., The, Chicago, Ill.
- Eimer & Amend, New York, N. Y.
- Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
- Foxboro Co., Foxboro, Mass.
- ● Hays Corp., Michigan City, Ind.
- Hill, E. Vernon, Chicago, Ill.
- Hotstream Heater Co., Cleveland, O.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Leeds & Northrup Co., Philadelphia, Pa.
- Lonergan Co., J. E., Philadelphia, Pa.
- Marsh Corp., Jas. P., Chicago, Ill.
- Marshalltown Mfg. Co., Marshalltown, Ia.
- ● Mercoid Corp., Chicago, Ill.
- Meriam Instrument Co., The Cleveland, O.
- Moeller Instrument Co., Richmond Hill, N. Y.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Norgren Co., C. A., Denver, Colo.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Republic Flow Meters Co., Chicago, Ill.
- Rochester Mfg. Co., Rochester, N. Y.
- Scientific Instrument Co., Detroit, Mich.
- ● Taylor Instrument Companies, Rochester, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Trane Co., The, La Crosse, Wis.
- Trerice Co., H. O., Detroit, Mich.
- Triplex Heating Specialty Co., Peru, Ind.
- Uehling Instrument Co., Paterson, N. J.
- United States Gauge Co., Sellersville, Pa.
- Weksler Thermometer Corp., New York, N. Y.
- Wheelco Instruments Co., Chicago, Ill.

## GAGES, INDICATING, VACUUM

- American Schaeffer & Budenberg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
- Ashton Valve Co., Cambridge, Mass.
- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Bailey Meter Co., Cleveland, O.
- Belfield Co., H., Philadelphia, Pa.
- Bristol Co., Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- Certified Gauge & Instrument Corp., Long Island City, N. Y.
- Defender Instrument and Regulator Co., St. Louis, Mo.
- ● Dole Valve Co., The, Chicago, Ill.
- Eimer & Amend, New York, N. Y.
- Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div. La Crosse, Wis.
- Foxboro Co., Foxboro, Mass.
- ● Hays Corp., Michigan City, Ind.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Lonergan Co., J. E., Philadelphia, Pa.
- Marsh Corp., Jas. P., Chicago, Ill.
- Marshalltown Mfg. Co., Marshalltown, Ia.
- ● Mercoid Corp., Chicago, Ill.
- Meriam Instrument Co., The, Cleveland, O.
- Moeller Instrument Co., Richmond Hill, N. Y.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Republic Flow Meters Co., Chicago, Ill.
- Rochester Mfg. Co., Rochester, N. Y.
- Scientific Instrument Co., Detroit, Mich.
- ● Taylor Instrument Companies, Rochester, N. Y.
- ● Trane Co., The, La Crosse, Wis.
- Trerice Co., H. O., Detroit, Mich.
- Uehling Instrument Co., Paterson, N. J.
- United States Gauge Co., Sellersville, Pa.
- Weksler Thermometer Corp., New York, N. Y.

## GAGES, LIQUID LEVEL

- Alloy Steel Products Co., Linden, N. J. (Stainless steel)
- American Injector Co., Detroit, Mich.
- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Bordo Co., Inc., L. J., Glenside, Pa.
- Boston Auto Gage Co., Pittsfield, Mass.
- Bristol Co., Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- ● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
- Caldwell Co., W. E., Louisville, Ky.
- Defender Instrument and Regulator Co., St. Louis, Mo.
- ● Detroit Lubricator Co., Detroit, Mich.
- Diamond Power Specialty Corp., Detroit, Mich.
- Foxboro Co., Foxboro, Mass.
- Frick Co., Waynesboro, Pa.
- Hanlon-Waters, Tulsa, Okla.
- ● Hays Corp., Michigan City, Ind.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Keckley Co., O. C., Chicago, Ill.
- King Engineering Corp., Ann Arbor, Mich.
- Klingerit, Inc., New York, N. Y.
- ● Krueger Sentry Gauge Co., Green Bay, Wis.
- ● Leeds & Northrup Co., Philadelphia, Pa.
- Liquidometer Corp., Long Island City, N. Y.
- Lonergan Co., J. E., Philadelphia, Pa.
- Lunkenheimer Co., Cincinnati, O.
- Meriam Instrument Co., The, Cleveland, O.
- Morey & Jones, Ltd., Los Angeles, Calif.
- Nason Co., Detroit, Mich.
- Penberthy Injector Co., Detroit, Mich.
- Petrometer Corp., Long Island City, N. Y.
- Powell Co., Wm., Cincinnati, O.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Reliance Gauge Column Co., Cleveland, O.
- Republic Flow Meters Co., Chicago, Ill.
- Rochester Mfg. Co., Rochester, N. Y.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Schutte & Koerting Co., Philadelphia, Pa.
- Scientific Instrument Co., Detroit, Mich.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- ● Taylor Instrument Companies, Rochester, N. Y.
- Techtmann Industries, Inc., Milwaukee, Wis.
- Trimount Instrument Co., Chicago, Ill.
- Uehling Instrument Co., Paterson, N. J.
- United States Gauge Co., Sellersville, Pa.
- Viking Pump Co., Cedar Falls, Ia.
- Williams Gauge Co., Pittsburgh, Pa. (Water)
- Wright-Austin Co., Detroit, Mich.
- ● Yarnall-Waring Co., Philadelphia, Pa.

## GALVANIZED SHEETS

*See Sheets, Steel, Galvanized*

● Advertisement in this issue. See Index to Advertisers, page 350.

## GALVANNEALED SHEETS
*See Sheets, Steel, Galvannealed*

## GAS BURNERS
*See Burners, Gas*

## GAS ENGINES
*See Engines, Gas*

## GAS FIRED RADIATORS
*See Radiators, Gas Fired*

## GAS PRESSURE REGULATORS
*See Regulators, Pressure, Gas*

## GAS VOLUME METERS
*See Meters, Volume, Air and Gas*

## GASKETS

Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill. (Felt, rubber)
Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Akron Metallic Gasket Co., Akron, O. (Metal & metal asbestos)
Alpha Metals, Inc., Brooklyn, N. Y.
American Smelting & Refining Co., New York, N. Y.
Anchor Packing Co., Philadelphia, Pa. (Asbestos)
● Armstrong Cork Co., Lancaster, Pa. (Cork & cork composition)
Azor Corp., Irvington, N. J. (Spiral wound)
Baldwin Belting, Inc., New York, N. Y.
Belmont Packing & Rubber Co., Philadelphia, Pa.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y. (Lead)
Chase Brass & Copper Co., Waterbury, Conn. (Brass)
Chicago-Wilcox Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Continental Diamond Fibre Co., Newark, Del.
Continental Rubber Wks., Erie, Pa.
● Crane Co., Chicago, Ill.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y. (Asbestos)
Durabla Mfg. Co., New York, N. Y. (Asbestos fibre)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Endura Mfg. Corp., Quakertown, Pa. (Paper, fibre)
Excelsior Leather Washer Mfg. Co., Rockford, Ill.
Felt Products Mfg. Co., Chicago, Ill. (Heat and oil resisting)
Felters Co., Inc., Boston, Mass.
Flexatalic Gasket Co., Camden, N. J. (Metal, asbestos)
Flexlock Corp., Akron, O.
Frick Co., Waynesboro, Pa.
Garlock Packing Co., Palmyra, N. Y. (Rubber, asbestos, fibre, semi-metallic)
Gates Rubber Co., The, Denver, Colo.
Gatke Corp., Chicago, Ill.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill. (Asbestos)
Graton & Knight Co., Worcester, Mass. (Leather)
Greene, Tweed & Co., New York, N. Y.
Houghton & Co., E. F., Philadelphia, Pa. (Leather)
● Jenkins Bros., New York, N. Y. (Ring asbestos or rubber sheet)
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Klingerit, Inc., New York, N. Y.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
Metallo Gasket Co., New Brunswick, N. J. (Metal, metal asbestos)
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
● Mortell Co., J. W., Kankakee, Ill.
National Engineering Products, Inc., Washington, D. C. (Plastic)
National Lead Co., New York, N. Y.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Permatex Co., Inc., Brooklyn, N. Y.
Quaker Rubber Corp., Philadelphia, Pa.
Resistoflex Corp., Belleville, N. J.
Ruberoid Co., New York, N. Y. (Asbestos)
Schieren Co., Chas. A., New York, N. Y.
Sherwin-Williams Co., The, Cleveland, O.
Smooth-On Mfg. Co., Jersey City, N. J. (Corrugated iron)
Steel Improvement & Forge Co., Cleveland, O.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Technical Ply-Woods, Chicago, Ill.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Gasket Co., Camden, N. J.
United States Rubber Co., New York, N. Y. (Rubber, asbestos)
United States Stoneware Co., New York, N. Y.
Vibration Engineering Co., The, New York, N. Y. (cork)
Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.
Werner Co., Inc., R. D., New York, N. Y.
Western Felt Wks., Chicago, Ill. (Felt)
● Wilson, Inc., Grant, Chicago, Ill. (Asbestos)

## GASOLINE FIRED HEATERS
*See Heaters, Gasoline Fired*

## GATE VALVES
*See Valves, Gate*

## GATES, BLAST

Allington & Curtis Mfg. Co., Saginaw, Mich.
Berger Bros. Co., Philadelphia, Pa.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Clarage Fan Co., Kalamazoo, Mich.
Day Co., The, Minneapolis, Minn.
Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
Maysteel Products, Inc., Mayville, Wis.
National Metal Fabricators, Chicago, Ill.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
R-S Products Corp., Philadelphia, Pa.
Spencer Turbine Co., Hartford, Conn.
● Sturtevant Co., B. F., Boston, Mass.
Western Blower Co., Seattle, Wash.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.

## GLASS, HEAT ABSORBING
*See Windows, Heat Insulating*

## GLASS PIPE
*See Pipe, Glass*

## GLASSES, GAGE

Bache, Semon & Co., New York, N. Y.
Chicago Specialty Mfg. Co., Chicago, Ill.
Corning Glass Works, Corning, N. Y.
● Crane Co., Chicago, Ill.
Durabla Mfg. Co., New York, N. Y.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Fischer & Porter Co., Hatboro, Pa.
Klingerit, Inc., New York, N. Y.
Libbey-Owens Ford Glass Co., Toledo, O.
Lunkenheimer Co., Cincinnati, O.
Powell Co., Wm., Cincinnati, O.
Semon Bache & Co., New York, N. Y.

## GLASSES, SIGHT, FOR PIPE LINES

Bowser, Inc., Fort Wayne, Ind.
Cochrane Corp., Philadelphia, Pa.
Corning Glass Works, Corning, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Libbey-Owens Ford Glass Co., Toledo, O.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Weatherhead Co., Cleveland, O.

## GLOBE VALVES
*See Valves, Globe*

## GOVERNORS, PUMP

Atlas Valve Co., Inc., Newark, N. J.
Boylston Steam Specialty Co., Chicago, Ill.
Burrows Mfg. Co., F. A., York, Pa.
● Cash Co., A. W., Decatur, Ill.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Gardner-Denver Co., Quincy, Ill.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
Jarecki Mfg. Co., Erie, Pa.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Northern Equipment Co., Erie, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sampsel Time Control, Inc., Spring Valley, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Squires Co., C. E., Cleveland, O.
Staples & Pfeiffer, San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

## GRILLES
*See also Diffusers; Panels, Perforated, for Air Diffusion; Registers*

A-J Mfg. Co., Kansas City, Mo.
Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Air Control Products, Inc., Coopersville, Mich.
Air Devices, Inc., New York, N. Y.
AirO-Fin Register Co., Detroit, Mich.
American Foundry & Furnace Co., Bloomington, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

American Warming & Ventilating Co., Toledo, O.
● Auer Register Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Beckley Perforating Co., Garwood, N. J.
Best Register Co., Milwaukee, Wis.
Central Wire & Iron Works, Des Moines, Ia.
Char-Gale Mfg. Co., Minneapolis, Minn.
● Crown Iron Works, Minneapolis, Minn.
Decatur Iron & Steel Co., Decatur, Ala.
Diamond Mfg. Co., Wyoming, Pa.
Eaglesfield Ventilator Co., Indianapolis, Ind. (wood)
Empire Ventilation Equipment Co., Long Island City, N. Y.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago, Ill.
Hart & Cooley Mfg. Co., Holland, Mich.
Hendrick Mfg. Co., Carbondale, Pa.
Independent Register Co., Cleveland, O.
Jamieson Mfg. Co., Dallas, Tex.
Johnston & Chapman Co., Chicago, Ill.
Lamneck Products, Inc., Middletown, O.
Lockjoint Wood Products Co., Wichita, Kans. (Wood)
Manhattan Perforated Metal Co., Inc., Long Island City, N. Y.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Mundt & Sons, Charles, Jersey City, N. J.
Newman Brothers, Inc., Cincinnati, O.
Register & Grille Mfg. Co., Brooklyn, N. Y.
Reliable Perforating Co., Chicago, Ill.
Rock Island Register Co., Rock Island, Ill.
Schoedinger, F. O., Columbus, O.
Standard Stamping & Perforating Co., Chicago, Ill.
Stewart Mfg. Co., Bloomfield, N. J.
● Tuttle & Bailey, Inc., New Britain, Conn.
● United States Air Conditioning Corp., Minneapolis, Minn.
United States Register Co., Battle Creek, Mich.
Utility Appliance Corp., Los Angeles, Calif.
Waterloo Register Co., Waterloo, Ia.
Western Wire & Iron Works, Inc., Chicago, Ill.
Wickwire Spencer Steel Co., New York, N. Y.

## GUNS AND POTS, SMOKE AND SMUDGE, FOR TESTING AIR MOVEMENT

Hill, E. Vernon, Chicago, Ill.
Newman Co., Inc., I. C., New York, N. Y. (smoke containers)
Pains Fireworks Display Co., New York, N. Y.

## HAND SHEARS

*See Shears and Snips, Hand*

## HANGERS OR BRACKETS, RADIATOR

American Foundry & Furnace Co., Bloomington, Ill.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
Carpenter & Paterson, Inc., East Boston, Mass.
Carty & Moore Engineering Co., Detroit, Mich.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Hartmann Co., Chas., Brooklyn, N. Y.
Healy Ruff Co., St. Paul, Minn.
Jennison Co., Fitchburg, Mass. (Adjustable radiator foot rest)
● McAlear Mfg. Co., Chicago, Ill.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
United States Radiator Corp., Detroit, Mich.
Western Hanger Co., San Francisco, Calif.

## HANGERS AND SUPPORTS, PIPE

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
● American District Steam Co., North Tonawanda, N. Y.
Carpenter & Paterson, Inc., East Boston, Mass.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Farley Sleeve & Hanger Co., Cleveland, O.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Genspring, Inc., New York, N. Y.
Globe Machine & Stamping Co., Div. of Hupp Motor Car Corp., Cleveland, O.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Packless Metal Products Corp., New Rochelle, N. Y. (Flexible fasteners for metal hose and tubing)
Paine Co., Chicago, Ill.
Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
Ravena Iron Co., Ravena, N. Y.
● Reznor Mfg. Co., Mercer, Pa.
● Ric-wiL Co., Cleveland, O. (Underground)
Rockwood Sprinkler Co., Worcester, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.
Truscon Steel Co., Youngstown, O.
● Walworth Co., New York, N. Y.
Western Wire Products Co., St. Louis, Mo.

## HARD RUBBER PIPE AND FITTINGS

*See Pipe, Hard Rubber; Fittings, Pipe, Hard Rubber*

## HEADERS, WELDED

● Acme Industries, Inc., Jackson, Mich.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Biggs Boiler Works Co., E. Akron, O.
Chicago Nipple Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
● Crane Co., Chicago, Ill.
Downingtown Iron Works, Downingtown, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
● Grinnell Co., Inc., Providence, R. I.
International Engineering Wks., Inc., Framingham, Mass.
Kellogg Co., M. W., The, New York, N. Y.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Limbert & Co., Geo. B., Chicago, Ill.
Lumsden & Van Stone Co., South Boston, Mass.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Pipe Bending Co., New Haven, Conn.
National Valve & Mfg. Co., Pittsburgh, Pa.
Naylor Pipe Co., Chicago, Ill.
Ohio Pipe Bending & Mach. Co., Cleveland, O.
Philadelphia Pipe Bending Co, Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Etna, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
Rempe Co., Chicago, Ill.
Richmond Engineering Co., Inc., Richmond, Va.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
Shaw Co., Benjamin F., Wilmington, Del.
Shaw-Kendall Engineering Co., Toledo, O.
Vilter Mfg. Co., Milwaukee, Wis.
● Walworth Co., New York, N. Y.
● Whitlock Mfg. Co., Hartford, Conn.
Zallea Brothers & Johnson, Wilmington, Del.

## HEADS, EXHAUST, FOR PIPE LINES

Aeolus Dickinson, Chicago, Ill.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Dickinson, Aeolus, Chicago, Ill.
Hoppes Mfg. Co., Springfield, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Wright-Austin Co., Detroit, Mich.

## HEADS, SPRINKLER

Binks Mfg. Co., Chicago, Ill.
Cleghorn Co., Boston, Mass.
● Grinnell Co., Inc., Providence, R. I.
Hodgman Mfg. Co., Taunton, Mass.
Raisler Corp., Grimes Sprinkler Div., New York, N. Y.
Rockwood Sprinkler Co., Worcester, Mass.

## HEAT EXCHANGERS

*See Chillers, Water; Condensers, Refrigerating; Exchangers, Heat; Surface, Cooling; Surface, Heating*

## HEATERS, AIR, DIRECT FIRED

Air Devices, Inc., New York, N. Y.
● Airtherm Mfg. Co., St. Louis, Mo.
American Foundry & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Campbell Heating Co., Des Moines, Ia.
Campbell Heating Co., E. K., Kansas City, Mo.
Columbus Heating & Ventilating Co., Columbus, O.
Despatch Oven Co., Minneapolis, Minn.
● Dravo Corp., Pittsburgh, Pa.
Drying Systems, Inc., Chicago, Ill.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Hare Engineering Co., Detroit, Mich.
Jackson & Church Co., Saginaw, Mich.
Lee Engineering Co., Youngstown, O.
Magirl Foundry & Furnace Wks., P. H., Bloomington, Ill.
McCann Furnace Co., Cleveland, O.
National Airoil Burner Co., Inc., Philadelphia, Pa.
● National Heater Co., Minneapolis, Minn.
National Machine Gas Burners, Div. of Mid-Continent Metal Products Co., Chicago, Ill.
National Mfg. & Engineering Co., Detroit, Mich.
Nelson Co., Detroit, Mich.
● Palmer Mfg. Corp., Phoenix, Ariz.
Ross Engineering Corp., J. O., New York, N. Y.
Smith, Inc., James Campbell, Cleveland, O.
Sonner Burner Co., Winfield, Kans.
● Surface Combustion, Toledo, O.
XXth Century Heating and Ventilating Co., Akron, O.
Whiting Corp., Harvey, Ill.
Williams, Inc., F. C., Dearborn, Mich.

## HEATERS, CONVECTION

*See Radiation, Convection Type*

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## HEATERS, DUCT, ELECTRIC

Consolidated Car-Heating Co., Inc., Albany, N. Y.
Despatch Oven Co., Minneapolis, Minn.
General Electric Co., Schenectady, N. Y.
Harvey-Whipple, Inc., Springfield, Mass.
Hynes Electric Heating Co., Camden, N. J.
Trent Co., Harold E., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., Pittsburgh, Pa.

## HEATERS, DUCT, GAS

● Bryant Heater Co., The, Cleveland, O.
● Dravo Corp., Pittsburgh, Pa.
International Sales Co., San Francisco, Calif.
Kehm Corp., The, Chicago, Ill.
● Palmer Mfg. Corp., Phoenix, Ariz.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
● Reznor Mfg. Co., Mercer, Pa.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Shreveport Engineering Co., Inc., Shreveport, La.
● Surface Combustion, Toledo, O.
XXth Century Heating and Ventilating Co., Akron, O.
Utility Appliance Corp., Los Angeles, Calif.

## HEATERS, FEEDWATER

*See Deaerators*

## HEATERS, GASOLINE FIRED (FOR AIRCRAFT AND PORTABLE GROUND USE)

Anchor Post Fence Co., Fluid Heat Div., Baltimore 24, Md.
Selas Corp of America, Strato-Heater Div.: Philadelphia, Pa.
Solar Aircraft Co., San Diego, Calif.
Stewart-Warner Corp., Chicago, Ill.
● Surface Combustion, Toledo, O.

## HEATERS, INDIRECT, SUBMERGED

● Bell & Gossett Co., Morton Grove, Ill.
Davis Engineering Corp., Elizabeth, N. J.
Frank Heaters, Inc., Paterson, N. J.
● General Fittings Co., Providence, R. I.
Richmond Engineering Co., Inc., Richmond, Va.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Taco Heaters, Inc., New York, N. Y.
Western Blower Co., Seattle, Wash.

## HEATERS, STRIP AND IMMERSION, ELECTRIC

American Instrument Co., Silver Spring, Md.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Cutler-Hammer, Inc., Milwaukee, Wis.
Electric Arc, Inc., Newark, N. J.
Falcon Equipment Co., New Brighton, Pa.
General Electric Co., Schenectady, N. Y.
H. & A. Co., Buffalo, N. Y.
Hynes Electric Heating Co., Camden, N. J.
Landis & Gyr, inc., New York, N. Y.
Red Spot Electric Co., Tacoma, Wash.
Trent Co., Harold E., Philadelphia, Pa.
Vulcan Electric Co., Danvers, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., Pittsburgh, Pa.

## HEATERS, UNIT, ELECTRIC HEATING ELEMENT

Burnham Boiler Corp., Irvington, N. Y. (Radiator)
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Electric Air Heater Co., Div. American Foundry Equipment Co., Mishawaka, Ind.
General Electric Co., Schenectady, N. Y.
Hynes Electric Heating Co., Camden, N. J.
● Ilg Electric Ventilating Co., Chicago, Ill.
Red Spot Electric Co., Tacoma, Wash.
Samson-United Corp., Rochester, N. Y.
Trent Co., Harold E., Philadelphia, Pa.
Vulcan Electric Co., Danvers, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., Pittsburgh, Pa.

## HEATERS, UNIT, GAS FIRED

American Foundry & Furnace Co., Bloomington, Ill.
Automatic Gas Equipment Co., Pittsburgh, Pa.
Beck Engineering Combustion Kompany, St. Louis, Mo.
● Bryant Heater Co., The, Cleveland, O.
Campbell Heating Co., E. K., Kansas City, Mo.
Clow & Sons, James B., Chicago, Ill.
● Dravo Corp., Pittsburgh, Pa.
General Gas Light Co., Kalamazoo, Mich.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Sales Co., San Francisco, Calif.
Lee Engineering Co., Youngstown, O.
● McCord Corp., Detroit, Mich.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
● Palmer Mfg. Corp., Phoenix, Ariz.
● Reznor Mfg. Co., Mercer, Pa.
Shreveport Engineering Co., Inc., Shreveport, La.
● Surface Combustion, Toledo, O.
Utility Appliance Corp., Los Angeles, Calif.

## HEATERS, UNIT, OIL FIRED

American Foundry & Furnace Co., Bloomington, Ill.
Beck Engineering Combustion Kompany, St. Louis, Mo.
● Dravo Corp., Pittsburgh, Pa.
Hare Engineering Co., Detroit, Mich.
Lee Engineering Co., Youngstown, O.

## HEATERS, UNIT, STEAM AND HOT WATER

● Airtherm Mfg. Co., St. Louis, Mo.
American Blower Corp., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Beacon-Morris Corp., Boston, Mass.
Bern's Specialty Mfg. Co., Chicago, Ill.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
● Caldwell Co., Wm. J., Washington, D. C.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
Champion Unit Heater Co., Chicago, Ill.
● Clarage Fan Co., Kalamazoo, Mich.
● Dunham Co., C. A., Chicago, Ill.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
● Grinnell Co., Inc., Providence, R. I.
Hartzell Propeller Fan Co., Piqua, O.
Harvey-Whipple, Inc., Springfield, Mass.
Hastings Air Conditioning Co., Hastings, Neb.
● Ilg Electric Ventilating Co., Chicago, Ill.
Industrial Mfg. & Engrg. Co., Chicago, Ill.
Jaden Mfg. Co., Hastings, Neb.
Johnson Fan & Blower Corp., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
Kisco Boiler & Engineering Co., St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
● Marlo Coil Co., St. Louis, Mo.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
● Modine Mfg. Co., Racine, Wis.
● Murray Mfg. Co., D. J., Wausau, Wis.
National Radiator Co., The, Johnstown, Pa.
● Nelson Corp., Herman, Moline, Ill.
● Nesbitt, Inc., John J., Philadelphia, Pa.
New York Blower Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Engineering Co., Inc., Richmond, Va.
Rome-Turney Radiator Co., Rome, N. Y.
Ross Engineering Corp., J. O., New York, N. Y.
Semco Mfg. Co., Nashville, Tenn.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
● Sturtevant Co., B. F., Boston, Mass.
Super Radiator Corp., Minneapolis, Minn.
Tenney Engineering, Inc., Montclair, N. J.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
● Webster & Co., Warren, Camden, N. J.
Western Blower Co., Seattle, Wash.
● Wing Mfg. Co., L. J., New York, N. Y.
● Young Radiator Co., Racine, Wis.

## HEATERS, VENTILATION

*See Ventilators, Unit*

## HEATERS, WATER, CAST IRON, COAL FIRED

Adams Co., The, Dubuque, Ia.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Burnham Boiler Corp., Irvington, N. Y.
Cleghorn Co., Boston, Mass.
● Crane Co., Chicago, Ill.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
Gehl Bros. Mfg. Co., West Bend, Wis.
Glo Heat Equipment Co., New York, N. Y.
International Heater Co., Utica, N. Y.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Prox Co., Inc., Frank, Terre Haute, Ind.
Schwitzer-Cummins Co., Indianapolis, Ind.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Thatcher Furnace Co., Garwood, N. J.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

## HEATERS, WATER, ELECTRIC

Edison General Electric Appliance Co., Inc., Chicago, Ill.
Glo Heat Equipment Co., New York, N. Y.
Hotstream Heater Co., Cleveland, O.
Hynes Electric Heating Co., Camden, N. J.
Red Spot Electric Co., Tacoma, Wash.
Trent Co., Harold E., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Mansfield, O.

## HEATERS, WATER, GAS FIRED

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bryant Heater Co., The, Cleveland, O.
● Crane Co., Chicago, Ill.
Dahlquist Mfg. Co., Inc., Somerville, Mass.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Gerstein & Cooper Co., South Boston, Mass.
Glo Heat Equipment Co., New York, N. Y.
Handley Brown Heater Co., Jackson, Mich.
Hotstream Heater Co., Cleveland, O.

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International Engineering Wks., Inc., Framingham, Mass.
Kresno-Stamm Mfg. Co., New York, N. Y.
Montgomery Bros., San Francisco, Calif.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Pittsburgh Water Heater Corp., Pittsburgh, Pa.
Richmond Radiator Co., Uniontown, Pa.
Rotary Mfg. Co., Los Angeles, Calif.
Ruud Mfg. Co., Pittsburgh, Pa.
Schoedinger, F. O., Columbus, O.
Sellers Engineering Co., Chicago, Ill.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Sonner Burner Co., Winfield, Kans.
Stout & Sons, David, St. Louis, Mo.
United States Radiator Corp., Detroit, Mich.

## HEATERS, WATER, INDIRECT

Akwa Heaters, Inc., New York, N. Y.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
Bryan Steam Corp., Peru, Ind.
Davis Engineering Corp., Elizabeth, N. J.
Downingtown Iron Works, Downingtown, Pa.
Ferguson & Lange Foundry Co., Chicago, Ill.
Frank Heaters, Inc., Paterson, N. J.
● General Fittings Co., Providence, R. I.
Hotstream Heater Co., Cleveland, O.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
Kehm Corp., The, Chicago, Ill.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Vapor Car Heating Co., Inc., Chicago, Ill.
Western Blower Co., Seattle, Wash.
● Whitlock Mfg. Co., Hartford, Conn.

## HEATERS, WATER, INDIRECT, COMBINATION TANK AND TANKLESS

● Bell & Gossett Co., Morton Grove, Ill.
Burnham Boiler Corp., Irvington, N. Y.
Davis Engineering Corp., Elizabeth, N. J.
Gerstein & Cooper Co., South Boston, Mass.
Hotstream Heater Co., Cleveland, O.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
Richmond Engineering Co., Inc., Richmond, Va.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
● Trane Co., The, LaCrosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Western Blower Co., Seattle, Wash.
● Whitlock Mfg. Co., Hartford, Conn.

## HEATERS, WATER, OIL FIRED

Aeroil Burner Co., Inc., West New York, N. J. (portable)
Air Devices, Inc., New York, N. Y.
Bethlehem Foundry & Machine Co., Bethlehem, Pa.
Century Engineering Corp., Cedar Rapids, Ia.
Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
Dahlquist Mfg. Co., Inc., Somerville, Mass.
Electrol Mfg. Co., Passaic, N. J.
Gerstein & Cooper Co., South Boston, Mass.
Glo Heat Equipment Co., New York, N. Y.
Hotstream Heater Co., Cleveland, O.
International Engineering Wks., Inc., Framingham, Mass.
Johnson Co., S. T., Oakland, Calif.
Kleen-Heet, Inc., Chicago, Ill.
Kresno-Stamm Mfg. Co., New York, N. Y.
Littleford Bros., Cincinnati, O.
Lonergan Mfg. Co., Albion, Mich.
National Airoil Burner Co., Inc., Philadelphia, Pa.
Nu-Way Corp., Rock Island, Ill.
Pacific Steel Boiler Div., United States Radiator Corp., Detroit, Mich.
Pan-American Engineering Co., Berkeley, Calif.
● Petroleum Heat & Power Co., Stamford, Conn.
Preferred Utilities Mfg. Corp., New York, N. Y.
Ray Oil Burner Co., San Francisco, Calif.
Reif-Rexoil, Inc., Buffalo, N. Y.
Scott-Newcomb, Inc., St. Louis, Mo.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Spencer Heater Div., The Aviation Corp. Williamsport, Pa.
United States Radiator Corp., Detroit, Mich.
Vapor Car Heating Co., Inc., Chicago, Ill.
Viking Mfg. Corp., Dayton, O.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
York-Heat Div., York-Shipley, Inc., York, Pa.

## HEATERS, WATER, STEAM, INSTANTANEOUS

Akwa Heaters, Inc., New York, N. Y.
● American District Steam Co., North Tonawanda, N. Y.
American Locomotive Co., Alco Products Div., New York, N. Y
● Bell & Gossett Co., Morton Grove, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Davis Engineering Corp., Elizabeth, N. J.
Downingtown Iron Works, Downingtown, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Frank Heaters, Inc., Paterson, N. J.
● General Fittings Co., Providence, R. I.
General Furnaces Corp., New York, N. Y.
Gerstein & Cooper Co., South Boston, Mass.
Hasco Valve & Machine Co., Milwaukee, Wis.
Heat Transfer Products, Inc., New York, N. Y.
Howard Iron Wks. & Alberger Heater Co., Buffalo, N. Y.
Johnson Corp., Three Rivers, Mich.
Koven & Bro., Inc., L. O. Jersey City, N. J.
Montgomery Bros., San Francisco, Calif.
National Pipe Bending Co., New Haven, Conn.
O'Brien Steam Specialty Co., Syracuse, N. Y.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Pick Mfg. Co., West Bend, Wis. (direct steam injection)
Quaker City Iron Works, Philadelphia, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J
Super Radiator Corp., Minneapolis, Minn.
● Swartwout Co., Cleveland, O.
Taco Heaters, Inc., New York, N. Y.
● Trane Co., The, LaCrosse, Wis.
● Whitlock Mfg. Co., Hartford, Conn.
Zallea Brothers & Johnson, Wilmington, Del.

## HEATERS, WATER, STEAM, STORAGE

Akwa Heaters, Inc., New York, N. Y.
● American District Steam Co., North Tonawanda, N. Y
● Bell & Gossett Co., Morton Grove, Ill.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
Burnham Boiler Corp., Irvington, N. Y
Davis Engineering Co., Elizabeth, N. J.
Downington Iron Works, Downington, Pa.
Frank Heaters, Inc., Paterson, N. J.
● General Fittings Co., Providence, R. I.
Gerstein & Cooper Co., South Boston, Mass.
Heat Transfer Products, Inc., New York, N. Y.
Howard Iron Wks. & Alberger Heater Co., Buffalo, N. Y.
International Engineering Wks., Inc., Framingham, Mass.
Johnson Corp., Three Rivers, Mich.
● Kewanee Boiler Corp., Kewanee, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
Manitowoc Boiler Wks., Manitowoc, Wis.
National Pipe Bending Co., New Haven, Conn.
O'Brien Steam Specialty Co., Syracuse, N. Y.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Quaker City Iron Works, Philadelphia, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Rotary Mfg. Co., Los Angeles, Calif.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Stout & Sons, David, St. Louis, Mo.
Super Radiator Corp. Minneapolis, Minn.
● Trane Co., The, LaCrosse, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
Warren Electric Appliance Co., Warren, Pa. (Electric)
Waterfilm Boilers, Inc., Jersey City, N. J.
● Whitlock Mfg. Co., Hartford, Conn.

## HEATERS, WATER, STEEL, COAL FIRED

Aeroil Burner Co., Inc., West New York, N. J. (portable)
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Catskill Metal Works, Inc., Catskill, N. Y.
● Fitzgibbons Boiler Co., New York, N. Y.
International Engineering Wks., Inc., Framingham, Mass.
Johnson Bros., Inc., Ferrysburg, Mich.
● Kewanee Boiler Corp., Kewanee, Ill.
Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
National Radiator Co., The, Johnstown, Pa.
Pacific Steel Boiler Div., United States Radiator Corp, Detroit Mich.
Pan-American Engineering Co., Berkeley, Calif.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa
Stokermatic Div., Rheem Mfg. Co., Salt Lake City, Utah.

## HEATING BOILERS

*See Boilers, Heating*

## HEATING COILS

*See Surface, Heating*

## HEATING SURFACE

*See Surface, Heating*

## HOSE, METAL AND FITTINGS

● Aeroquip Corp., Jackson, Mich.
American Metal Hose Branch, American Brass Co., Waterbury, Conn.
Atlantic Metal Hose Co., Inc., New York, N. Y.
Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.
Chicago Metal Hose Corp., Maywood, Ill.
Everhot Products Co., Chicago, Ill.
Packless Metal Products Corp., New Rochelle, N. Y.
Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa.
Seamlex Co., Inc., Long Island City, N. Y.
Titeflex, Inc., Newark, N. J.
United Metal Hose Co., Inc., Long Island City, N. Y.
Zallea Brothers & Johnson, Wilmington, Del.

● Advertisement in this issue. See Index to Advertisers, page 350.

## HOSE, NON-METAL, AND FITTINGS

● Aeroquip Corp., Jackson, Mich.
Boston Woven Hose & Rubber Co., Boston, Mass.
Goodrich Co., B. F., Akron, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Republic Rubber Div., Lee Rubber and Tire Corp., Youngstown, O.
Resistoflex Corp., Belleville, N. J.
● Tinnerman Products, Inc., Cleveland, O. (clamps)
United States Rubber Co., New York, N. Y.

## HOT WATER HEATING SYSTEMS

*See Systems, Heating, Hot Water*

## HOT WATER PRESSURE REGULATORS

*See Regulators, Pressure, Hot Water Heating Systems*

## HOUSINGS, FAN, CENTRIFUGAL

*(Housing only—not complete fans)*

Air Controls, Inc., Cleveland, O.
Brundage Co., The, Kalamazoo, Mich.
● Clarage Fan Co., Kalamazoo, Mich.
● Commercial Shearing & Stamping Co., Youngstown, O.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
● Detroit Stamping Co., Detroit, Mich.
Economy Electric Mfg. Co., Chicago, Ill.
Hastings Air Conditioning Co., Inc., Hastings, Nebr.
● Lau Blower Co., Dayton, O.
Martin Fan & Blower Co., Chicago, Ill.
National Mfg. & Engineering Co., Detroit, Mich.
Northern Blower Co., Cleveland, O.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Sandberg Sheet Metal Works, Portland, Ore.
Schwitzer-Cummins Co., Indianapolis, Ind.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Torrington Mfg. Co., Torrington, Conn.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utica Products, Inc., Utica, N. Y.
Viking Air Conditioning Corp., Cleveland, O.

## HOUSINGS, FAN, PROPELLER

*(Housings only—not complete fans)*

● Commercial Shearing & Stamping Co., Youngstown, O.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Northern Blower Co., Cleveland, O.
Schwitzer-Cummins Co., Indianapolis, Ind.

## HUMIDIFIERS, CENTRAL PLANT

● Air & Refrigeration Corp., New York, N. Y.
American Blower Corp., Detroit, Mich.
● Armstrong Machine Wks., Three Rivers, Mich.
Bahnson Co., Winston-Salem, N. C.
● Barber-Colman Co., Rockford, Ill.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Cleveland Humidifier Co., Cleveland, O.
Farr Co., Los Angeles, Calif.
● Johnson Service Co., Milwaukee, Wis.
Mellish & Murray Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Engineering & Mfg. Co., Kansas City, Mo.
Parks-Cramer Co., Fitchburg, Mass.
● Powers Regulator Co., Chicago, Ill.
Research Corp., New York, N. Y.
Ross Engineering Corp., J. O., New York, N. Y.
Skuttle Mfg. Co., Detroit, Mich.
Steamaire Co., Cincinnati, O.
Strandwitz & Co., Inc., W. J., Camden, N. J.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
● Surface Combustion, Toledo, O.
Tenney Engineering, Inc., Montclair, N. J.
● Trane Co., The, La Crosse, Wis.
Viking Air Conditioning Corp., Cleveland, O.
Vilter Mfg. Co., Milwaukee, Wis.

## HUMIDIFIERS, DIRECT, SPRAY HEAD

● Air & Refrigeration Corp., New York, N. Y.
American Moistening Co., Providence, R. I.
Anetsberger Bros., Chicago, Ill.
Bahnson Co., Winston-Salem, N. C.
Binks Mfg. Co., Chicago, Ill.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
● Chelsea Fan & Blower Co., Irvington, N. J.
Drying Systems, Inc., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
International Moistening Co., Providence, R. I.
Manufacturers Machine Co., North Andover, Mass.
● Marley Co., Inc., The, Kansas City, Kans.
● Murray Mfg. Co., D. J., Wausau, Wis.
New York Blower Co., Chicago, Ill.
Parks-Cramer Co., Fitchburg, Mass.
Pfening Co., Fred D., Columbus, O.
Rhode Island Humidifier & Ventilating Co., Boston, Mass.
Ross Sprinkler Co., Pasadena, Calif.
Somers, Inc., H. J., Detroit, Mich.
Spray Engineering Co., Somerville, Mass.
● Spraying Systems Co., Chicago, Ill.
Steamaire Co., Cincinnati, O.
Supreme Electric Products Corp., Rochester, N. Y.
● Trane Co., The, LaCrosse, Wis.
Utility Appliance Corp., Los Angeles, Calif.
Water Cooling Corp., New York, N. Y.

## HUMIDIFIERS FOR RADIATORS AND CONVECTORS

Bridgeport Brass Co., Bridgeport, Conn.
Lowell Air Conditioning Corp., Philadelphia, Pa.
● Maid-O'-Mist, Inc., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Patent Novelty Co., Fulton, Ill.
Skilbeck Mfg. Co., Kenosha, Wis.
Techtmann Industries, Inc., Milwaukee, Wis.

## HUMIDIFIERS, RADIATOR VENT VALVE

● Maid-O'-Mist, Inc., Chicago, Ill.
Skilbeck Mfg. Co., Kenosha, Wis.

## HUMIDIFIERS, UNIT, ROOM TYPE (Without Heating)

Carrier Corp., Syracuse, N. Y.
Comfort Products Corp., Harvey, Ill.
General Air Conditioning Corp., Cincinnati, O.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Lion Mfg. Corp., Chicago, Ill.
● Murray Mfg. Co., D. J., Wausau, Wis.
National Engineering & Mfg. Co., Kansas City, Mo.
Norwood Filtration Co., The, Florence, Mass.
Skilbeck Mfg. Co., Kenosha, Wis.
Somers, Inc., H. J., Detroit, Mich.
● Spraying Systems Co., Chicago, Ill.
Standard Engineering Wks., Pawtucket, R. I.
Steamaire Co., Cincinnati, O.
Tenney Engineering, Inc., Montclair, N. J.
● United States Air Conditioning Corp., Minneapolis, Minn.
Water Cooling Corp., New York, N. Y.

## HUMIDIFYING RADIATORS

*See Radiators, Humidifying*

## HUMIDISTATS

American Moistening Co., Providence, R. I.
● Au-Temp-Co Corp., New York, N. Y.
Bahnson Co., Winston-Salem, N. C.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
● Detroit Lubricator Co., Detroit, Mich.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
H-B Instrument Co., Philadelphia, Pa.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Parks-Cramer Co., Fitchburg, Mass.
● Penn Electric Switch Co., Goshen, Ind.
● Powers Regulator Co., Chicago, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
Standard Engineering Wks., Pawtucket, R. I.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.

## HUMIDITY RECORDERS

*See Recorders, Humidity*

## HUMIDITY AND TEMPERATURE CONTROLS

*See Humidistats; Recorder-Controllers; Thermostats*

## HYDRAULIC SPEED CHANGERS

*See Changers, Speed, Hydraulic Coupling*

## HYGROMETERS

American Moistening Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Eimer & Amend, New York, N. Y.
Fee and Stemwedel, Inc., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hill, E. Vernon, Chicago, Ill.
International Moistening Co., Providence, R. I.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa. (recording)
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Parks-Cramer Co., Fitchburg, Mass.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.

## HYGROSTATS

*See Humidistats*

## IMMERSION THERMOSTATS

*See Thermostats, Immersion*

## INDICATING THERMOMETERS

*See Thermometers, Indicating*

● Advertisement in this issue. See Index to Advertisers, page 350.

## INDICATOR-CONTROLLERS, PRESSURE

Bailey Meter Co., Cleveland, O.
Bristol Co., The, Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Foxboro Co., Foxboro, Mass.
Hanlon-Waters, Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Shallcross Controls, Inc., Milwaukee, Wis.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

## INDICATOR-CONTROLLERS, RELATIVE HUMIDITY

● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co.. Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.

## INDICATOR-CONTROLLERS, TEMPERATURE

Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Pyrometer Instrument Co., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

## INDICATORS, CARBON DIOXIDE, BOILER ROOM

*For portable $CO_2$ analyzers, see Analyzers, Carbon Dioxide, Portable*

Defender Instrument and Regulator Co., St. Louis, Mo.
Engelhard, Inc., Chas., Newark, N. J.
Ess Instrument Co., Fort Lee, N. J.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Weaver Mfg. Co., Springfield, Ill.

## INDICATORS, FLOW

*See Meters, Flow*

## INDICATORS, SOUND LEVEL

General Electric Co., Schenectady, N. Y.

## INDIRECT HEATING SURFACE

*See Surface, Heating*

## INDIRECT WATER HEATERS

*See Heaters, Water, Indirect*

## INDUSTRIAL AIR CONDITIONERS

*See Units, Air Conditioning, Industrial Type*

## INDUSTRIAL DRYERS

*See Dryers, Industrial*

## INSTANTANEOUS WATER HEATERS

*See Heaters, Water, Steam, Instantaneous*

## INSULATION, BOILER AND TANK

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Alfol Insulation Co., Inc., New York, N. Y. (Aluminum foil)
Alton Mineral Wool Insulation Co., Alton, Ill.
● Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Bird-Archer Co., Philadelphia, Pa.
Botfield Refractories Co., Philadelphia, Pa.
Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Cork)
Eagle-Picher Lead Co., Cincinnati, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa. (Magnesia)
● Grant Wilson, Inc., Chicago, Ill.
Green Fire Brick Co., A. P., Mexico, Mo.
Hinde & Dauch Paper Co., Sandusky, O.
International Vermiculite Co., Girard, Ill.
Jamar Co., Walker, Duluth, Minn.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y. (Asbestos)
Keasbey & Mattison Co., Ambler, Pa.
Krehbiel Co., J. H., Chicago, Ill.
Mitchell & Smith, Inc., Detroit, Mich.
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Rock wool)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos and magnesia)
● Owens-Corning Fiberglas Corp., Toledo, O. (Blanket)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y. (Blanket, block, cement)
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Rock Fleece Co., El Paso, Tex.
Ruberoid Co., New York, N. Y. (Asbestos, magnesia)
Sall Mountain Co., Chicago, Ill.
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J.
Standard Asbestos Mfg. Co., Chicago, Ill.
Tennessee Products Corp., Nashville, Tenn.
Therminsul Corp., Kalamazoo, Mich. (Felted block)
● Union Asbestos & Rubber Co., Cicero, Ill.
United Cork Co., Kearny, N. J. (Cork)
Universal Zonolite Insulation Co., Chicago, Ill. (Plastic)
Walker Jamar Co., Duluth, Minn.
● Wilson, Inc., Grant, Chicago, Ill.

## INSULATION, BUILDING

Acme Asbestos Covering & Flooring Co., Chicago, Ill. (Rock wool)
Air-O-Cel Industries, Inc., Detroit, Mich.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
Alton Mineral Wool Insulation Co., Alton, Ill.
Aluminum Co. of America, Pittsburgh, Pa.
American Flange & Mfg. Co., Inc., New York, N. Y. (Metal sheets)
American Hair & Felt Co., Chicago, Ill. (Hair felt)
● Armstrong Cork Co., Lancaster, Pa. (Corkboard, fibreboard and cellular glass)
Bache & Co., Semon, New York, N. Y. (Glass wool)
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Cabot, Inc., Samuel, Boston, Mass. (Flexible)
Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Rock wool)
Carney Rockwool Co., Mankato, Minn.
Celotex Corp., The, Chicago, Ill.
Certain-teed Products Corp., New York, N. Y. (Board, reflective)
Chamberlin Metal Weather Strip Co., Detroit, Mich. (Rock wool)
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Corkboard)
Doheny Co., John J., Belmont, Mass. (Blanket)
Dry-Zero Corp., Chicago, Ill.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool, blankets, batts, granulated, loose)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Fir-Tex Insulating Board Co., St. Helens, Ore. (Wood fibreboard)
Flintkote Co., The, New York, N. Y. (Fiber board and rock wool)
General Insulating Products Co., Brooklyn, N. Y. (Rock wool)
● Grant Wilson, Inc., Chicago, Ill. (Rockwool)
Hinde & Dauch Paper Co., Sandusky, O.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn. (Wood fibre)
Insul-Wool Insulation Corp., Wichita, Kans.
International Vermiculite Co., Girard, Ill. (Loose fill)
Johns-Manville, New York, N. Y. (Rock wool and wood fibreboard)
Johnston Tin Foil & Metal Co., St. Louis, Mo. (Foil, aluminum tin, lead)
Keasbey Co., Robert A., New York, N. Y. (Rock wool)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Kimberly-Clark Corp., Neenah, Wis.
Ludowici-Celadon Co., Chicago, Ill. (wool)
Marblehead Lime Co., Chicago, Ill. (Rock wool)
Masonite Corp., Cellufoam Products Div., Chicago, Ill.
Mineral Insulation Co., Chicago Ridge, Ill. (Rock wool)
Mitchell & Smith, Inc., Detroit, Mich.
Multi-Cell Sales Corp., Minneapolis, Minn. (Blanket, quilted newspaper)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn & Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific Lumber Co., The, San Francisco, Calif.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Plastergon Wall Board Co., Buffalo, N. Y. (Rigid board)
Poe Co., C. W., Cleveland, O.
Refractory & Insulation Corp., New York, N. Y. (Rock, slag wool)
Reynolds Metal Co., Richmond, Va.

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Robinson Insulation Co., Great Falls, Mont.
Rock Fleece Co., El Paso, Tex.
Ruberoid Co., New York, N. Y. (Mineral wool)
Russell Co., F. C., Cleveland, O.
Semon Bache & Co., New York, N. Y. (Glass wool)
Silvercote Products, Inc., Chicago, Ill.
Specialty Converters, Inc., East Braintree, Mass. (Reflective insulation)
Sprayo-Flake Co., Chicago, Ill.
Standard Asbestos Mfg. Co., Chicago, Ill. (Asbestos, hairfelt)
Standard Lime & Stone Co., Baltimore, Md. (Rock wool)
Tennessee Products Corp., Nashville, Tenn.
Therminsul Corp., Kalamazoo, Mich. (Rock wool block)
Truscon Steel Co., Youngstown, O. (Insulation board sealed between metal sheets)
United Cork Companies, Lyndhurst, N. J. (Cork)
United States Gypsum Co., Chicago, Ill. (Wool and board)
United States Mineral Wool Co., Chicago, Ill. (Mineral wool)
Universal Gypsum & Lime Co., Chicago, Ill. (Loose fill)
Universal Zonolite Insulation Co., Chicago, Ill. (Loose fill)
Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.
Western Mineral Products Co., Omaha 1, Nebr.
Wilson & Co., Chicago, Ill. (Board)
● Wilson, Inc., Grant, Chicago, Ill. (Rock wool)
Wood Conversion Co., St. Paul, Minn.

## INSULATION, CEILING AND WALL, SOUND DEADENING

*Acoustical treatment only—for thermal insulation, see Insulation, Building*

Air-O-Cel Industries, Inc., Detroit, Mich.
American Hair & Felt Co., Chicago, Ill.
● Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Celotex Corp., The, Chicago, Ill.
Doheny Co., John J., Belmont, Mass.
Felters Co., Inc., Boston, Mass.
Fir-Tex Insulating Board Co., St. Helens, Ore.
General Insulating Products Co., Brooklyn, N. Y.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn.
Insul-Wool Insulation Corp., Wichita, Kans.
Inter-Coastal Paint Corp., East St. Louis, Ill.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Masonite Corp., Chicago, Ill. (Fibreboard)
Mitchell & Smith, Inc., Detroit, Mich.
● Mundet Cork Corp., Brooklyn, N. Y.
National Gypsum Co., Buffalo, N. Y.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific Lumber Co., The, San Francisco, Calif.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Sprayo-Flake Co., Chicago, Ill.
Technical Ply-Woods, Chicago, Ill.
Therminsul Corp., Kalamazoo, Mich.
United States Gypsum Co., Chicago, Ill.
Universal Zonolite Insulation Co., Chicago, Ill.
Western Silicair Products, Inc., Burbank, Calif.
Wood Conversion Co., St. Paul, Minn.

## INSULATION, DUCT, SOUND DEADENING

*For application inside duct*

American Hair & Felt Co., Chicago, Ill.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Cabot, Inc., Samuel, Boston, Mass.
Celotex Corp., The, Chicago, Ill.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Felters Co., Inc., Boston, Mass.
● Grant Wilson, Inc., Chicago, Ill.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Kimberly-Clark Corp., Neenah, Wis.
● Mortell Co., J. W., Kankakee, Ill.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Reynolds Metals Co., Richmond, Va.
Telsit Insulation Co., Bronx, N. Y.
United States Rubber Co., New York, N. Y.
Universal Zonolite Insulation Co., Chicago, Ill.
Western Felt Works, Chicago, Ill.
Western Silicair Products, Inc., Burbank, Calif.
● Wilson, Inc., Grant, Chicago, Ill.

## INSULATION, DUCT, THERMAL

Acme Asbestos Covering & Flooring Co., Chicago, Ill. (Asbestos)
Air-O-Cel Industries, Inc., Detroit, Mich.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
American Flange & Mfg. Co., Inc., New York, N. Y. (Metal sheets)
American Hair & Felt Co., Chicago, Ill. (Hair felt)
● Armstrong Cork Co., Lancaster, Pa. (Corkboard, fibreboard)
Baldwin-Hill Co., Trenton, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Cabot, Inc., Samuel, Boston, Mass. (Flexible)
Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Asbestos)
Celotex Corp., The, Chicago, Ill.
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Cork board)
Dry-Zero Corp., Chicago, Ill.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool blankets)
Ehret Magnesia Mfg. Co., Valley Forge, Pa. (Cork, magnesia, hair felt)
Felters Co., Inc., Boston, Mass. (Wool felt)
Fir-Tex Insulating Board Co., St. Helens, Ore. (Wood fibreboard)
General Insulating Products Co., Brooklyn, N. Y. (Acoustic rock wool)
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, O.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn. (Wood fibre)
International Vermiculite Co., Girard, Ill. (Block)
Johns-Manville, New York, N. Y. (Rock cork, asbestos)
Keasbey Co., Robert A., New York, N. Y. (Asbestos and cork)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Kennedy, Inc., David E., Brooklyn, N. Y.
Keystone Asphalt Products Co., Chicago, Ill.
Kimberly-Clark Corp., Neenah, Wis.
Masonite Corp., Chicago, Ill.
Mineral Insulation Co., Chicago Ridge, Ill. (Rock wool)
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
● Mortell Co., J. W., Kankakee, Ill. (Plastic cork coating)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Block)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos and wool felt)
● Owens-Corning Fiberglas Corp., Toledo, O. (Blanket)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y. (Block, blanket)
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Rock Fleece Co., El Paso, Tex.
Ruberoid Co., New York, N. Y. (Asbestos cellular and laminated sheets or blocks)
Sall Mountain Co., Chicago, Ill. (Asbestos)
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J. (Asbestos air cell type)
Sprayo-Flake Co., Chicago, Ill.
Standard Asbestos Mfg. Co., Chicago, Ill. (Asbestos, hair felt)
Telsit Insulation Co., Bronx, N. Y.
Therminsul Corp., Kalamazoo, Mich. (Rock wool bats, loose and granulated)
United Cork Companies, Lyndhurst, N. J. (Cork)
United States Mineral Wool Co., Chicago, Ill.
Universal Zonolite Insulation Co., Chicago, Ill. (Plastic)
Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.
Western Felt Wks., Chicago, Ill. (Felt)
Wilson & Co., Chicago, Ill. (Flexible)
● Wilson, Inc., Grant, Chicago, Ill.
Wood Conversion Co., St. Paul, Minn.

## INSULATION, PIPE

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
● American District Steam Co., North Tonawanda, N. Y. (Underground)
American Hair & Felt Co., Chicago, Ill.
● Armstrong Cork Co., Lancaster, Pa. (Cork)
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Asbestos, magnesia)
Cork Import Corp., New York, N. Y. (Cork)
Cork Insulation Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, O.
International Vermiculite Co., Girard, Ill. (Vermiculite)
Jamar Co., Walker, Duluth, Minn.
Johns-Manville, New York, N. Y. (Asbestos, magnesia, rock cork)
Keasbey Co., Robert A., New York, N. Y. (Asbestos and cork)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos, magnesia)
Masonite Corp., Chicago, Ill.
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
Monsanto Chemical Co., Merimac Div., Everett, Mass.
● Mortell Co., J. W., Kankakee, Ill. (Plastic cork coating)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Moulded)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos, magnesia)

● Advertisement in this issue. See Index to Advertisers, page 350.

● Owens-Corning Fiberglas Corp., Toledo, O. (Sectional and flexible)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
● Porter & Co., Inc., H. W., Newark, N. J. (Underground)
Quigley Co., Inc., New York, N. Y.
● Ric-wiL Co., Cleveland, O. (Underground)
Rock Fleece Co., El Paso, Tex.
Ruberoid Co., New York, N. Y. (Asbestos, magnesia)
Sall Mountain Co., Chicago, Ill. (Asbestos)
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J. (Asbestos air cell, wool felt and hair felt)
Standard Asbestos Mfg. Co., Chicago, Ill.
● Union Asbestos & Rubber Co., Cicero, Ill.
United Cork Companies, Lyndhurst, N. J.
Universal Zonolite Insulation Co., Chicago, Ill.
Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.
Walker Jamar Co., Duluth, Minn.
Western Mineral Products Co., Omaha, Nebr. (underground)
● Wilson, Inc., Grant, Chicago, Ill.
Wyckoff & Son Co., A., Elmira, N. Y. (Wood)

## IONIZATION APPARATUS

Coroaire Heater Corp., The, Cleveland, O.
Electroaire Corp., Chicago, Ill.
Montgomery Bros., San Francisco, Calif.
Norwood Filtration Co., The, Florence, Mass.
United States Ozone Co. of America, Scottdale, Pa.

## IRON BODY VALVES

*See Valves, Gate; and Valves, Globe*

## JACKETED PIPE

*See Pipe, Jacketed*

## JOINTS, PIPE, ELECTRICAL INSULATING

Barco Mfg. Co., Chicago, Ill.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.

## JOINTS, PIPE, EXPANSION, PACKLESS

● American District Steam Co., North Tonawanda, N. Y.
Badger Fire Extinguisher Co., Somerville, Mass.
● Badger & Sons Co., E. B., Boston, Mass. (Corrugated copper, stainless steel)
Barco Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
● Fulton Sylphon Co., Knoxville, Tenn.
Harris & Co., Arthur, Chicago, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
National Valve & Mfg. Co., Pittsburgh, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Semet-Solvay Engineering Corp., New York, N. Y.
United States Rubber Co., New York, N. Y.
Zallea Brothers & Johnson, Wilmington, Del.

## JOINTS, PIPE, EXPANSION, SLIP

● American District Steam Co., North Tonawanda, N. Y.
Belfield Co., H., Philadelphia, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
● Illinois Engineering Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Powell Co., Wm., Cincinnati, O.
Semet-Solvay Engineering Corp., New York, N. Y.
● Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.
● Yarnall-Waring Co., Philadelphia, Pa.

## JOINTS, PIPE, FLEXIBLE SWING AND REVOLVING

Barco Mfg. Co., Chicago, Ill.
Bordo Co., Inc., L. J., Glenside, Pa.
Chicago Metal Hose Corp., Maywood, Ill.
● Crane Co., Chicago, Ill.
Flexo Supply Co., Inc., St. Louis, Mo.
Patterson-Ballagh Corp., Los Angeles, Calif.
Powell Co., Wm., Cincinnati, O.
● Spraying Systems Co., Chicago, Ill.
Water Cooling Corp., New York, N. Y.

## JOINTS, UNIVERSAL, FOR OPERATING VALVES

Blood Brothers Machine Co., Allegan, Mich.
Brooks Equipment Corp., New York, N. Y.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Newman Brothers, Inc., Cincinnati, O.
Stow Mfg. Co., Binghampton, N. Y. (flexible shafts)

## KATA THERMOMETERS

*See Thermometers, Kata*

## LACQUERS

*See Enamels and Lacquers*

## LAMPS, STERILIZING, FOR DUCT INSTALLATION

General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

## LEAD PIPE

*See Pipe and Tubing, Lead and Lead Alloy*

## LEAD SHEETS

*See Sheets, Lead*

## LEAD TUBING

*See Pipe and Tubing, Lead and Lead Alloy*

## LEAK DETECTORS

*See Detectors, Leak, Refrigerant*

## LEATHER BELTING

*See Belting, Flat, Leather*

## LEATHER PACKING

*See Packing, Leather*

## LIGHTS, PILOT AND SIGNAL

Armstrong Heat Control Co., Portland, Ore.
Cooper Co., Clark, Palmyra, N. J.
Dial Light Co. of America, Inc., New York, N. Y.
● General Controls Co., Glendale, Calif.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
Hart Mfg. Co., The, Hartford, Conn.
Signal Indicator Co., New York, N. Y.
● Westinghouse Electric & Mfg. Co., Cleveland, O.

## LINKS, FUSIBLE

Century Fan & Ventilator Co., New York, N. Y.
● Grinnell Co., Inc., Providence, R. I.

## LIQUID LEVEL GAGES

*See Gages, Liquid Level*

## LIQUID LEVEL RECORDERS

*See Recorders, Liquid Level*

## LIQUID PRESSURE REGULATORS

*See Regulators, Pressure, Liquid*

## LOCK FORMING MACHINES

*See Machines, Pittsburgh Lock Forming*

## LOCK NUTS

*See Nuts, Lock*

## LOUVERS AND SHUTTERS, AUTOMATICALLY OR MANUALLY CONTROLLED

Air Conditioning Products Co., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Air Controls, Inc., Cleveland, O.
Airecon Industries, Detroit, Mich.
Airmaster Corp., Chicago, Ill.
● Allen Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
American Foundry & Furnace Co., Bloomington, Ill.
American Warming & Ventilating Co., Toledo, O.
Ames Co., W. R., San Francisco, Calif.
Arex Co., Chicago, Ill.
● Barber-Colman Co., Rockford, Ill.
Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Biersach & Niedermeyer Co., Milwaukee, Wis.
Bishop & Babcock Mfg. Co., Cleveland, O.
● Buffalo Forge Co., Buffalo, N. Y.
Burt Mfg. Co., Akron, O.
Campbell Heating Co., E. K., Kansas City, Mo.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Chicago Metal Mfg. Co., Chicago, Ill.
Circulators & Devices Mfg. Corp., New York, N. Y.
Clay Equipment Corp., Cedar Falls, Ia.
Decatur Iron & Steel Co., Decatur, Ala.
Dual Air Fan Co., Chicago, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Elgo Shutter & Mfg. Co., Detroit, Mich.
Gillian Mfg. Co., Detroit, Mich.
Guth Co., Edwin F., St. Louis, Mo.
Hirschman Co., W. F., Buffalo, N. Y.
International Engineering, Inc., Dayton, O.
International Steel Co., Evansville, Ind.
Jamieson Mfg. Co., Dallas, Tex.
Johnson Fan & Blower Corp., Chicago, Ill.
Johnson Co., William W., Dayton, O.
Jordan & Co., Paul R., Indianapolis, Ind.
Kelvin-White Co., Boston, Mass.
King Ventilating Co., Owatonna, Minn.
Kirk & Blum Mfg. Co., Cincinnati, O.
Klee Co., Geo. B., Cincinnati, O.
● Lau Blower Co., Dayton, O.
Leslie Welding Co., Chicago, Ill.
Lockjoint Wood Products Co., Wichita, Kans. (Wood; stationary door, wall, window and ceiling)
Martin Fan & Blower Co., Chicago, Ill.
Maysteel Products, Inc., Mayville, Wis.
Meier Electric & Machine Co., Indianapolis, Ind.
Meyer Mfg. Co., Detroit, Mich.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

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Myers Electric Co., Inc., Pittsburgh, Pa.
● Nelson Corp., Herman, Moline, Ill.
● Peerless Electric Co., Warren, O.
Reed Unit-Fans, Inc., New Orleans, La.
Richmond Fireproof Door Co., Richmond, Ind.
Riggin Metal Products, Inc., Kankakee, Ill.
Robertson Co., H. H., Pittsburgh, Pa.
Schoedinger, F. O., Columbus, O.
Signal Electric Mfg. Co., Menominee, Mich.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Standard Stamping & Perforating Co., Chicago, Ill.
● Sturtevant Co., B. F., Boston, Mass.
● Tuttle & Bailey, Inc., New Britain, Conn.
United States Register Co., Battle Creek, Mich.
Utility Appliance Corp., Los Angeles, Calif.
Van Noorden Co., E., Boston, Mass.
Victor Electric Products, Inc., Cincinnati, O.
Waterloo Register Co., Waterloo, Ia.

## LOW WATER CUT-OFFS

*See Cut-Offs, Low Water, Heating Boiler*

## MACHINES, BLUE PRINT AND WHITE PRINT

*For Reproducing Engineering Drawings*

American Photocopy Equipment Co., Chicago, Ill.
Bruning Co., Inc., Charles, Long Island City, N. Y.
Ozalid Products Div., General Aniline & Film Corp., Johnson City, N. Y.
Paragon-Revolute Corp., Rochester, N. Y.
Pease Co., C. F., The, Chicago, Ill.
Peck & Harvey, Chicago, Ill.
Wickes Brothers, Saginaw, Mich.

## MACHINES AND FILM, X-RAY

Eastman Kodak Co., Rochester, N. Y.
Kelly-Koet, Covington, Ky.
North American Philips Co., Inc., New York, N. Y.
Westinghouse Electric & Mfg Co., X-Ray Div., Baltimore, Md.

## MACHINES, PIPE CUTTING AND THREADING, PORTABLE

● Air Reduction Sales Co., New York, N. Y. (Cutting and beveling)
Beaver Pipe Tools, Inc., Warren, O.
Curtis & Curtis Co., The, Bridgeport, Conn.
Landis Machine Co., Inc., Waynesboro, Pa.
Linde Air Products Co., The, New York, N. Y. (Cutting and beveling)
National Machine Works, Chicago, Ill.
Nye Tool & Machine Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
● Ridge Tool Co., Elyria, O. (Hand)
Toledo Pipe Threading Machine Co., Toledo, O.

## MACHINES, PIPE CUTTING AND THREADING, STATIONARY

Beaver Pipe Tools, Inc., Warren, O.
Bignall & Keeler Machine Wks., Edwardsville, Ill.
Curtis & Curtis Co., The, Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
Landis Machine Co., Inc., Waynesboro, Pa.
Oster Mfg. Co., Cleveland, O.
Pines Engineering Co., Inc., Aurora, Ill.
Saunders Machine & Tool Corp., Yonkers, N. Y.
Spence Engineering Co., Inc., Walden, N. Y. (Beveling and cutting machine)
Toledo Pipe Threading Machine Co., Toledo, O.
Wallace Supplies Mfg. Co., Chicago, Ill.

## MACHINES, PITTSBURGH LOCK FORMING

Dahlstrom Machine Works, Chicago, Ill.
Lockformer Co., Chicago, Ill.
Maplewood Machinery Co., Inc., Chicago, Ill.
Ratter Machine Co., Belleville, N. J.
Whitney Metal Tool Co., Rockford, Ill.

## MACHINES, REFRIGERATION, ABSORPTION

Vogt Machine Co., Henry, Louisville, Ky.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
● York Corp., York, Pa.

## MACHINES, TESTING, WELD

● Air Reduction Sales Co., New York, N. Y.

## MACHINES, VERTICAL, THREADING AND BORING

Bullard Co., The, Bridgeport, Conn.

## MAGNESIUM ALLOY SHEETS

*See Sheets, Magnesium Alloy*

## MALLEABLE UNIONS

*See Unions, Malleable*

## MANIFOLDS, REFRIGERATION

Frick Co., Waynesboro, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Mueller Brass Co., Port Huron, Mich.
Superior Valve and Fittings Co., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.

Weatherhead Co., Cleveland, O.
● York Corp., York, Pa.

## MANOMETERS

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Defender Instrument and Regulator Co., St. Louis, Mo.
Dwyer Mfg. Co., F. W., Chicago, Ill.
● Hays Corp., Michigan City, Ind.
Hill, E. Vernon, Chicago, Ill.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Meriam Instrument Co., The, Cleveland, O.
Morey & Jones, Ltd., Los Angeles, Calif.
Precision Scientific Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

## MECHANICAL DRIVE TURBINES

*See Turbines, Mechanical Drive*

## MECHANICAL SPEED CHANGERS

*See Changers, Speed, Mechanical*

## MECHANICAL TRAPS

*See Traps, Steam, Mechanical*

## MERCURY SWITCHES

*See Switches, Mercury*

## METAL HOSE

*See Hose, Metal and Fittings*

## METAL, POROUS, FOR FILTRATION, SEPARATION, DIFFUSION AND FLOW CONTROL

● General Motors Corp., Moraine Products Div., Dayton, O.
Keystone Carbon Co., Inc., St. Marys, Pa.

## METALLIC PACKING

*See Packing, Metallic*

## METERS, AIR VELOCITY, DIRECT READING

Detroit Air Conditioning Service Co., Inc., Detroit, Mich.
● Hays Corp., Michigan City, Ind.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Taylor Instrument Companies, Rochester, N. Y.

## METERS, CONDENSATION

● American District Steam Co., North Tonawanda, N. Y.
Buffalo Meter Co., Buffalo, N. Y.
Central Station Steam Co., Detroit, Mich.
Cochrane Corp., Philadelphia, Pa.
Neptune Meter Co., New York, N. Y.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Worthington-Gamon Meter Co., Harrison, N. J.

## METERS, FLOW, REFRIGERANT

Bristol Co., Waterbury, Conn.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Fischer & Porter Co., Hatboro, Pa.
Neptune Meter Co., New York, N. Y.

## METERS, FLOW, STEAM

● American District Steam Co., North Tonawanda, N. Y.
American Meter Co., New York, N. Y.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Cochrane Corp., Philadelphia, Pa.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Meriam Instrument Co., The, Cleveland, O.
Morey & Jones, Ltd., Los Angeles, Calif.
Republic Flow Meters Co., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.

## METERS, PROCESS LIQUID

American Meter Co., Inc., New York, N. Y.
Bailey Meter Co., Cleveland, O.
Bowser, Inc., Fort Wayne, Ind.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Buffalo Meter Co., Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Cochrane Corp., Philadelphia, Pa.
Fischer & Porter Co., Hatboro, Pa.

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Foxboro Co., Foxboro, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
Meriam Instrument Co., The, Cleveland, O.
Morey & Jones, Ltd., Los Angeles, Calif.
Neptune Meter Co., New York, N. Y.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Republic Flow Meters Co., Chicago, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Schutte & Koerting Co., Philadelphia, Pa.
● Taylor Instrument Companies, Rochester, N. Y.
Worthington-Gamon Meter Co., Harrison, N. J.

## METERS, VOLUME, AIR AND GAS

American Meter Co., Inc., New York, N. Y.
Bristol Co., The, Waterbury, Conn.
Fischer & Porter Co., Hatboro, Pa.
● Hays Corp., Michigan City, Ind.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Selas Corp. of America, Philadelphia, Pa.

## METERS, WATER

Bailey Meter Co., Cleveland, O.
Buffalo Meter Co., Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Fischer & Porter Co., Hatboro, Pa.
Hersey Mfg. Co., South Boston, Mass.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Morey & Jones, Ltd., Los Angeles, Calif.
National Meter Co., Brooklyn, N. Y.
Neptune Meter Co., New York, N. Y.
Pfening Co., Fred D., Columbus, O. (batch measuring)
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Republic Flow Meters Co., Chicago, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Union Water Meter Co., Worcester, Mass.
Worthington-Gamon Meter Co., Harrison, N. J.

## MIXING VALVES

*See Valves, Mixing, Steam and Water*

## MODULATING VALVES

*See Valves, Radiator, Steam and Hot Water*

## MOTOR BASES

*See Bases and Pads, Vibration Isolating; Bases, Motor Tension Adjusting*

## MOTOR CONTROLLERS

*See Controllers and Starters, Motor*

## MOTOR OPERATED VALVES

*See Valves, Motor Operated*

## MOTOR STARTERS

*See Controllers and Starters, Motor*

## MOTORS, ELECTRIC, FRACTIONAL HP

● Baldor Electric Co., St. Louis, Mo.
● Barber-Colman Co., Rockford, Ill.
Bodine Electric Co., Chicago, Ill.
Brown-Brockmeyer Co., Dayton, O.
Canatsey Electric Mfg. Co., Kansas City, Mo.
Century Electric Co., St. Louis, Mo.
Delco Appliance Div., General Motors Corp., Rochester, N. Y.
Delco Products Div., General Motors Corp., Dayton, O.
Diehl Mfg. Co., Somerville, N. J.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Eastern Air Devices, Inc., Brooklyn, N. Y.
Electric Sprayit Co., Sheboygan, Wis.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
● Hansen Mfg. Co., Inc., Princeton, Ind.
● Holtzer-Cabot, Div. First Industrial Corp., Boston, Mass.
Howell Electric Motors Co., Howell, Mich.
● Janette Mfg. Co., Chicago, Ill.
● Leland Electric Co., Dayton, O.
Marathon Electric Mfg. Corp., Wausau, Wis.
Master Electric Co., Dayton, O.
Ohio Electric Mfg. Co., Cleveland, O.
● Peerless Electric Co., Warren, O.
Redmond Co., A. G., Owosso, Mich.
Reynolds Electric Co., Chicago, Ill.
Robbins & Myers, Inc., Springfield, O.
Russell Electric Co., Chicago, Ill.
Signal Electric Mfg. Co., Menominee, Mich.
Small Motors, Inc., Chicago, Ill.
Smith Mfg. Co., Inc., F. A., Rochester, N. Y.
Speedway Mfg. Co., Chicago (Cicero), Ill.
● Star Electric Motor Co., Bloomfield, N. J.
Sterling Electric Motors, Inc., Los Angeles, Calif.
● Sturtevant Co., B. F., Boston, Mass.
U. S. Electrical Motors, Inc., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.
● Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## MOTORS, ELECTRIC, 1 HP AND OVER

● Allis Co., Louis, The, Milwaukee, Wis.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
● Baldor Electric Co., St. Louis, Mo.
Bogue Electric Co., Paterson, N. J.
Brown-Brockmeyer Co., Dayton, O.
Burke Electric Co., Erie, Pa.
Byron Jackson Co., Los Angeles, Calif. (Submersible)
Canatsey Electric Mfg. Co., Kansas City, Mo.
Century Electric Co., St. Louis, Mo.
Continental Electric Co., Inc., Newark, N. J.
● Crocker-Wheeler Elec. Mfg. Co. Div., Joshua Hendy Iron Works, Ampere, N. J.
Delco Products Div., General Motors Corp., Dayton, O.
Diehl Mfg. Co., Somerville, N. J.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Ideal Electric & Mfg. Co., Mansfield, O.
Imperial Electric Co., Akron, O.
Jackson Co., Byron, Los Angeles, Calif. (Submersible)
● Janette Mfg. Co., Chicago, Ill.
● Leland Electric Co., Dayton, O.
Marathon Electric Mfg. Corp., Wausau, Wis.
Marble-Card Electric Co., Gladstone, Mich.
Master Electric Co., Dayton, O.
● Peerless Electric Co., Warren, O.
Philadelphia Gear Works, Inc., Philadelphia, Pa. (Geared)
Reliance Electric & Engineering Co., Cleveland, O.
Robbins & Myers, Inc., Springfield, O.
● Star Electric Motor Co., Bloomfield, N. J.
Sterling Electric Motors, Inc., Los Angeles, Calif.
● Sturtevant Co., B. F., Boston, Mass.
U. S. Electric Motors, Inc., Los Angeles, Calif.
● Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## MUSHROOM VENTILATORS

*See Ventilators, Mushroom*

## NEEDLE VALVES

*See Valves, Needle*

## NEUTRALIZERS, ACID

*See Dehydrant and Acid Neutralizer*

## NEUTRALIZERS, ODOR

*See Adsorbers, Odor*

## NICKEL AND NICKEL ALLOY PIPE AND FITTINGS

*See Tubing, Nickel and Alloy; Fittings, Pipe, Nickel and Nickel Alloy; Pipe, Nickel and Nickel Alloy*

## NICKEL AND NICKEL ALLOY SHEETS

*See Sheets, Nickel and Nickel Alloy*

## NIPPLES, PIPE, BRASS AND COPPER

Acheson Mfg. Co., Rankin, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nipple Mfg. Co., Chicago, Ill.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Imperial Brass Mfg. Co., Chicago, Ill.
● Mueller Brass Co., Port Huron, Mich.
Parker Appliance Co., The, Cleveland, O.
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
Sales & Co., Murray W., Detroit, Mich.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Weatherhead Co., Cleveland, O.

## NIPPLES, PIPE, IRON AND STEEL

Alabama Pipe Co., Anniston, Ala. (Cast iron)
Alloy Steel Products Co., Linden, N. J. (Stainless steel)
● Byers Co., A. M., Pittsburgh, Pa. (Wrought iron)
Chicago Nipple Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa. (Swage)
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
● Flori Pipe Co., The, St. Louis, Mo.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Hasco Valve & Machine Co., Milwaukee, Wis.
Illinois Malleable Iron Co., Chicago, Ill.
International Nickel Co., Inc., The, New York, N. Y. (Nickel and nickel alloy)
Larkin Packer Co., St. Louis, Mo.
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
Plumb Mfg. Co., Utica, N. Y.
Sales & Co., Murray W., Detroit, Mich.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
● Youngstown Sheet & Tube Co., Youngstown, O.

## NOISE ELIMINATORS

*See Bases and Pads, Vibration Isolating; Hose, Metal and Fittings; Insulation, Sound Deadening*

● Advertisement in this issue. See Index to Advertisers, page 350.

## NOZZLES, SPRAY

American Cooling Tower Co., Kansas City, Mo.
American Molded Products Co., Chicago, Ill.
April Showers Co., Washington, D. C.
Bahnson Co., Winston-Salem, N. C.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Bayley Blower Co., Milwaukee, Wis.
Benjamin Air Rifle Co., St. Louis, Mo.
Binks Mfg. Co., Chicago, Ill.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Chain Belt Co., Milwaukee, Wis.
● Clarage Fan Co., Kalamazoo, Mich.
DeVilbiss Co., The, Toledo, O.
Dustlix Corp., Milwaukee, Wis.
Eclipse Air Brush Co., Inc., Newark, N. J.
Electric Sprayit Co., Sheboygan, Wis.
Fluor Corp., Ltd., The, Los Angeles, Calif.
International Moistening Co., Providence, R. I.
● Link-Belt Co., Chicago, Ill.
Lonn Mfg. Co., Inc., Chicago, Ill.
● Marley Co., Inc., The, Kansas City, Kans.
● Martocello & Co., Jos. A., Philadelphia, Pa.
Milburn Co., Alexander, Baltimore, Md.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
National Engineering & Mfg. Co., Kansas City, Mo.
Parks-Cramer Co., Fitchburg, Mass.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Plummer Spray Equipment Co., Napoleon, O.
Rega Mfg. Co., Rochester, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Ross Sprinkler Co., Pasadena, Calif.
Schutte & Koerting Co., Philadelphia, Pa.
Skinner Irrigation Co., Troy, O.
Spray Engineering Co., Somerville, Mass.
● Spraying Systems Co., Chicago, Ill.
● Sturtevant Co., B. F., Boston, Mass.
Supreme Electric Products Corp., Rochester, N. Y.
Thermal Industries, Indio, Calif.
Water Cooling Corp., New York, N. Y.
Water Cooling Equipment Corp., St. Louis, Mo.
● Yarnall-Waring Co., Philadelphia, Pa.

## NUTS, LOCK

Buffalo Bolt Co., North Tonawanda, N. Y.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Dzus Fastener Co., Inc., Babylon, N. Y.
Elastic Stop Nut Corp. of America, Union, N. J.
● Flori Pipe Co., The, St. Louis, Mo.
● Grinnell Co., Inc., Providence, R. I.
Kwikon Co., Chicago, Ill.
Lamson & Sessions Co., Cleveland, O.
Locknut Corp. of America, Chicago, Ill.
MacLean-Fogg Lock Nut Co., Chicago, Ill.
Malleable Iron Fittings Co., Branford, Conn.
Palnut Co., Irvington, N. J.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
SKF Industries, Inc., Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
● Tinnerman Products, Inc., Cleveland, O.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

## OBSERVATION BOILER PORTS

*See Ports, Observation, Boiler*

## ODOR ADSORBERS

*See Filters, Air; Adsorbers, Odor*

## ODOR NEUTRALIZERS

*See Adsorbers, Odor; Compounds, Air Freshening*

## OIL BURNERS

*See Burners, Oil*

## OIL COOLERS

*See Coolers, Oil*

## OIL FIRED UNIT HEATERS

*See Heaters, Unit, Oil Fired*

## OIL SEPARATORS

*See Separators, Steam and Oil*

## OPEN END WRENCHES

*See Wrenches, Open End*

## OPERATORS, DAMPER, DUCT

Arens Controls, Inc., Chicago, Ill.
● Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., The, Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
Hotstream Heater Co., Cleveland, O.
● Johnson Service Co., Milwaukee, Wis.
Mason-Nielan Regulator Co., Boston, Mass.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Perfex Corp., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
Sampsel Time Control, Inc., Spring Valley, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Young Regulator Co., Cleveland, O.

## OPERATORS, VALVE

● Au-Temp-Co Corp., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Cook Electric Co., Chicago, Ill.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Cutler-Hammer, Inc., Milwaukee, Wis.
Foxboro Co., Foxboro, Mass.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
Grove Regulator Co., Oakland, Calif.
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
● Johnson Service Co., Milwaukee, Wis.
Mason-Neilan Regulator Co., Boston, Mass.
● McDonnell & Miller, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Perfex Corp., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Zenith Associates, Newton, Mass.

## ORIFICES, RADIATOR

Armstrong Heat Control Co., Portland, Ore.
● Au-Temp-Co Corp., New York, N. Y.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
● Dunham Co., C. A., Chicago, Ill.
● Haines & Co., William S., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
New York Air Valve Corp., New York, N. Y.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
Tallmadge & Co., Webster, East Orange, N. J.
● Thrush & Co., H. A., Peru, Ind.
Webster Tallmadge & Co., East Orange, N. J.

## OXY-ACETYLENE WELDING

*See Welding and Cutting Apparatus, Oxy-Acetylene*

## OZONE APPARATUS

A & J Co., Chicago, Ill.
Automatic Pump & Softener Corp., Rockford, Ill.
● Chelsea Fan & Blower Co., Irvington, N. J.
Coroaire Heater Corp., The, Cleveland, O.
Electroaire Corp., Chicago, Ill.
Montgomery Bros., San Francisco, Calif.
Norwood Filtration Co., The, Florence, Mass.
Ozone Air Co., Grand Rapids, Mich.
Sealkote Corp., Chicago, Ill.
United States Ozone Co. of America, Scottdale, Pa.

## PACKAGED STEAM GENERATORS

*See Boilers, Steam Generating Units, Heating and Process*

## PACKING, ASBESTOS

Acme Asbestos Coverings & Flooring Co., Chicago, Ill.
Allpax Co., Inc., Mamaroneck, N. Y.
Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Chicago Specialty Mfg. Co., Chicago, Ill.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y.
Durabla Mfg. Co., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Felt Products Mfg. Co., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Goodyear Tire & Rubber Co., Akron, O.
● Grant Wilson, Inc., Chicago, Ill.
Greene, Tweed & Co., New York, N. Y.
● Jenkins Bros., New York, N. Y.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Klingerit, Inc., New York, N. Y. (Sheet and rod)
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Metallo Gasket Co., New Brunswick, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Sall Mountain Co., Chicago, Ill.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.
● Wilson, Inc., Grant, Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

## PACKING, FIBER

Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Darcoid Co., Inc., New York, N. Y.
Durabla Mfg. Co., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Endura Mfg. Corp., Quakertown, Pa.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
● Jenkins Bros., New York, N. Y.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
McQuay-Norris Mfg. Co., St. Louis, Mo.
Metallo Gasket Co., New Brunswick, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.

## PACKING, LEATHER

Alexander Bros., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Chicago Belting Co., Chicago, Ill.
Davies & Co., Wayne, Worcester, Mass.
Excelsior Leather Washer Mfg. Co., Rockford, Ill.
Graton & Knight Co., Worcester, Mass.
Houghton & Co., E. F., Philadelphia, Pa.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Schieren Co., Chas. A., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.
Wayne Davies & Co., Worcester, Mass.
Williams & Son, I. B., Dover, N. H.

## PACKING, METALLIC

Allpax Co., Inc., Mamaroneck, N. Y.
Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Conneaut Plastic Metallic Packing Co., Conneaut, O.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y.
Felt Products Mfg. Co., Chicago, Ill.
France Packing Co., Tacony, Philadelphia, Pa.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Hound Packing Co., Chicago, Ill.
Johns-Manville, New York, N. Y.
Klingerit, Inc., New York, N. Y. (Sheet & rod)
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
McQuay-Norris Mfg. Co., St. Louis, Mo.
National Engineering Products, Inc., Washington, D. C.
National Lead Co., New York, N. Y.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.

## PACKING, RUBBER AND SYNTHETIC

Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Boston Woven Hose & Rubber Co., Boston, Mass.
Chicago Belting Co., Chicago, Ill.
Chicago Specialty Mfg. Co., Chicago, Ill.
Continental Rubber Wks., Erie, Pa.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Garlock Packing Co., Palmyra, N. Y.
Gates Rubber Co., Denver, Colo.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Graton & Knight Co., Worcester, Mass.
Hamilton Rubber Mfg. Co., Trenton, N. J.
● Jenkins Bros., New York, N. Y.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan Inc., Passaic, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.

## PANELS, PERFORATED, FOR AIR DIFFUSION

Pyle-National Co., The, Chicago, Ill.

## PARTS FOR HEATING AND AIR CONDITIONING EQUIPMENT

Ackermann Mfg. Co., Wheeling, W. Va.
Carey Mfg. Co., Philip, Cincinnati, O. (Insulating panel for housing and duct construction)
● Commercial Shearing & Stamping Co., Youngstown, O. (Tank heads and bottoms, water heater legs, furnace stampings, etc.)
● Detroit Stamping Co., Detroit, Mich.
Geuder, Paeschke & Frey Co., Milwaukee, Wis.
Lindsay and Lindsay, Chicago, Ill. (Cabinet construction for air conditioning and warm air heating equipment)
● Mueller Brass Co., Port Huron, Mich. (Specially fabricated copper tubing, machine formed tubes)

## PILLOW BLOCK BEARINGS

*See Bearings, Pillow Block*

## PILOT LIGHTS

*See Lights, Pilot and Signal*

## PIPE, ALUMINUM

*See Tubing, Aluminum*

## PIPE, ASBESTOS FIBER AND CEMENT

Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Ruberoid Co., New York, N. Y.
● Union Asbestos & Rubber Co., Cicero, Ill.
United States Stoneware Co., New York, N. Y.

## PIPE BENDERS

*See Benders, Pipe*

## PIPE, BRASS AND COPPER

● American Brass Co., Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
● Mueller Brass Co., Port Huron, Mich.
● Revere Copper and Brass, Incorporated, New York, N. Y.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

## PIPE, CAST IRON, PRESSURE, BELL AND SPIGOT

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Inner-Tite Clamp Corp., Elizabeth, N. J.
Lynchburg Foundry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
U. S. Pipe & Fdry. Co., Burlington, N. J.
Warren Foundry & Pipe Corp., New York, N. Y.

## PIPE, CAST IRON, PRESSURE, FLANGED

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Goodrich Co., B. F., Akron, O.
Inner-Tite Clamp Corp., Elizabeth, N. J.
Lynchburg Foundry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
U. S. Pipe & Fdry. Co., Burlington, N. J.
Warren Foundry & Pipe Corp., New York, N. Y.

## PIPE, CAST IRON, THREADED

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
Clow & Sons, James B., Chicago, Ill.
McWane Cast Iron Pipe Co., Birmingham, Ala.
Somerville Iron Wks., Somerville, N. J.
U. S. Pipe & Fdry. Co., Burlington, N. J.
Warren Foundry & Pipe Corp., New York, N. Y.

## PIPE CLEANING COMPOUNDS

*See Compounds, Cleaning, Pipe Coil and Condenser*

## PIPE COILS

*See Coils, Pipe*

## PIPE COUPLINGS

*See Couplings, Pipe*

## PIPE CUTTERS

*See Cutters*

## PIPE CUTTING MACHINES

*See Machines, Pipe Cutting and Threading*

## PIPE EXTRACTORS

*See Extractors, Pipe*

## PIPE, FIBER

Fibre Conduit Co., Orangeburg, N. Y.

● Advertisement in this issue. See Index to Advertisers, page 350.

### PIPE FITTINGS
*See Fittings, Pipe*

### PIPE FLANGES
*See Flanges, Pipe*

### PIPE, GLASS

Corning Glass Wks., Corning, N. Y.
Fischer & Porter Co., Hatboro, Pa.

### PIPE HANGERS
*See Hangers and Supports, Pipe*

### PIPE, HARD RUBBER

American Hard Rubber Co., New York, N. Y.
Goodrich Co., B. F., Akron, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
Stokes Rubber Co., Jos., Trenton, N. J.
United States Rubber Co., New York, N. Y.

### PIPE INSULATION
*See Insulation, Pipe*

### PIPE, JACKETED

Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Parks-Cramer Co., Fitchburg, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.

### PIPE JOINT COMPOUNDS
*See Cement and Compounds, Pipe Joint*

### PIPE, LINED

● American Brass Co., Waterbury, Conn. (Tin)
American Cast Iron Pipe Co., Birmingham, Ala. (Cement)
American Hard Rubber Co., New York, N. Y. (Rubber)
● American Rolling Mill Co., The, Middletown, O.
American Smelting & Refining Co., New York, N. Y.
Cement Lined Pipe Co., Lynn, Mass.
Clow & Sons, James B., Chicago, Ill.
Cohoes Rolling Mill Co., Cohoes, N. Y. (Cement)
General Plate Div., Metals & Controls Corp., Attleboro, Mass. (Silver lined)
Goodrich Co., B. F., Akron, O. (Rubber-lined)
Jones & Laughlin Steel Corp., Pittsburgh, Pa. (Cement)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead and tin lined)
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Manhattan Rubber Mfg. Co. Div. of Raybestos-Manhattan, Inc., Passaic, N. J. (Rubber)
Michigan Pipe Co., Bay City, Mich. (Wood)
National Lead Co., New York, N. Y. (Lead)
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa. (Cement)
Resisto Pipe & Valve Co., East Cambridge, Mass. (Lead)
United States Rubber Co., New York, N. Y. (Rubber)
United States Stoneware Co., New York, N. Y.
Vesco Corp., New York, N. Y. (Enamel)
Warren Foundry & Pipe Corp., New York, N. Y. (Cement-bituminous enamel)
● Youngstown Sheet & Tube Co., Youngstown, O.

### PIPE LINE STRAINERS
*See Strainers, Pipe Line*

### PIPE, NICKEL AND NICKEL ALLOY

General Plate Div., Metals & Controls Corp., Attleboro, Mass.
International Nickel Co., New York, N. Y.
● Revere Copper and Brass, Incorporated, New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

### PIPE NIPPLES
*See Nipples, Pipe*

### PIPE, PLASTIC

Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.
American Hard Rubber Co., New York, N. Y.
Carter Products Corp., Cleveland, O.
Commercial Plastics Co., Chicago, Ill.
Commonwealth Products Co., Philadelphia, Pa.
Continental Diamond Fibre Co., Newark, Del.
Extruded Plastics, Inc., Norwalk, Conn.
Hodgman Rubber Co., Framingham, Mass.
Mills Corp., Elmer E., Chicago, Ill.
North Penn Co., New York, N. Y.
Skuttle Mfg. Co., Detroit, Mich.
United States Stoneware Co., New York, N. Y.
Werner Co., Inc., R. D., New York, N. Y.
Yardley Plastics Co., Columbus, O.

### PIPE, PRE-INSULATED

Baldwin-Hill Co., Trenton, N. J.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
● Ric-wiL Co., Cleveland, O.

### PIPE REAMERS
*See Reamers, Pipe*

### PIPE REPAIR CLAMPS
*See Clamps, Pipe Repair*

### PIPE, SPIRAL, RIVETED AND WELDED

● American Rolling Mill Co., The, Middletown, O.
Naylor Pipe Co., Chicago, Ill.
● Revere Copper and Brass, Incorporated, New York, N. Y.
● Taylor Forge & Pipe Wks., Chicago, Ill.

### PIPE, STEEL, BUTT AND LAP WELDED

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
● American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Tank Corp., Dunellen, N. J.
● Byers Co., A. M., Pittsburgh, Pa.
Chicago Bridge & Iron Co., Chicago, Ill. (Specially fabricated)
Chicago Metal Mfg. Co., Chicago, Ill.
Cohoes Rolling Mill Co., Cohoes, N. Y.
Fretz-Moon Tube Co., Butler, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Tube Co., Pittsburgh, Pa.
● Republic Steel Corp., Cleveland, O.
● Revere Copper and Brass, Incorporated, New York, N. Y.
Semet-Solvay Engineering Corp., New York, N. Y. (Specially fabricated)
South Chester Tube Co., Chester, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Tippett & Wood, Phillipsburg, N. J. (12 in. and larger)
Wheatland Tube Co., Philadelphia, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

### PIPE, STEEL, SEAMLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pipe and Tube Products, Inc., Jersey City, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

### PIPE, STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Alloy Steel Products Co., Linden, N. J.
American Locomotive Co., Alco Products Div., New York, N. Y.
● American Rolling Mill Co., The, Middletown, O.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Globe Steel Tubes Co., Milwaukee, Wis.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.

### PIPE, STONEWARE

General Ceramics Co., Keasbey, N. J.
Knight, Maurice A., Akron, O. (Stoneware)
United States Stoneware Co., New York, N. Y. (Stoneware)

### PIPE SUPPORTS
*See Hangers and Supports, Pipe*

### PIPE TONGS
*See Tongs, Pipe*

### PIPE, TUBING, FITTINGS AND VALVES, CARBON AND GRAPHITE

National Carbon Co., New York, N. Y.

### PIPE AND TUBING, LEAD AND LEAD ALLOY

Alpha Metals, Inc., Brooklyn, N. Y.
American Smelting & Refining Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Gardiner Metal Co., Chicago, Ill.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Works, Inc., Rochester, N. Y.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
United States Stoneware Co., New York, N. Y.

### PIPE VISES
*See Vises, Pipe*

### PIPE, WOOD

● American District Steam Co., North Tonawanda, N. Y.
Caldwell Co., W. E., Louisville, Ky.
Michigan Pipe Co., Bay City, Mich.
Wyckoff & Son Co., A., Elmira, N. Y.

### PIPE WRENCHES
*See Wrenches, Pipe*

### PIPE, WROUGHT IRON

● Byers Co., A. M., Pittsburgh, Pa.

● Advertisement in this issue. See Index to Advertisers, page 350.

### PISTON RINGS
*See Rings, Piston*

### PITOT TUBES
*See Tubes, Pitot*

### PITTSBURGH LOCK FORMING MACHINES
*See Machines, Pittsburgh Lock Forming*

### PLASTIC PIPE AND PIPE FITTINGS
*See Pipe, Plastic; Fittings, Pipe, Plastic*

### PLASTIC TUBING
*See Tubing, Plastic*

### PLATES, FLOOR AND CEILING

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● American Rolling Mill Co., The, Middletown, O.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nipple Mfg. Co., Chicago, Ill.
Farley Sleeve & Hanger Co., Cleveland, O.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Globe Machine & Stamping Co., Div. of Hupp Motor Car Corp., Cleveland, O.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
Keeney Mfg. Co., Newington, Conn.
● Little Mfg. Co., M. S., Hartford, Conn.
Newman Brothers, Inc., Cincinnati, O.
Ravena Iron Co., Ravena, N. Y.
Russell Mfg. Co., John M., Naugatuck, Conn.
● Walworth Co., New York, N. Y.

### PLUG COCKS
*See Valves, Plug*

### PLUG VALVES
*See Valves, Plug*

### PLUGS, FUSIBLE, BOILER

● Detroit Lubricator Co., Detroit, Mich.
Walworth Co., New York, N. Y.

### POROUS METAL
*See Metal, Porous*

### PORTS, OBSERVATION, BOILER

Chicago Fire Brick Co., Chicago, Ill.
Detroit Stoker Co., Detroit, Mich.
National Airoil Burner Co., Inc., Philadelphia, Pa.
Preferred Utilities Mfg. Corp., New York, N. Y.
Sims Co., Erie, Pa.

### POSITIONERS, WELDING
*See Welding and Cutting Apparatus, Oxy-Acetylene*

### POWER SHEARS
*See Shears, Power*

### PREHEATERS, FUEL OIL

● American District Steam Co., North Tonawanda, N. Y.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Brown Fintube Co., The, Elyria, O.
Davis Engineering Corp., Elizabeth, N. J.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Downingtown Iron Works, Downingtown, Pa.
Engineer Co., New York, N. Y.
Frank Heaters, Inc., Paterson, N. J.
● General Fittings Co., Providence, R. I.
Griscom-Russell Co., New York, N. Y.
Heat Transfer Products, Inc., New York, N. Y.
Hynes Electric Heating Co., Camden, N. J.
Johnson Corp., Three Rivers, Mich.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O
National Airoil Burner Co., Inc., Philadelphia, Pa.
National Pipe Bending Co.. New Haven, Conn.
Oil Heat Master National Sales, New York, N. Y.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Preferred Utilities Mfg. Corp., New York, N. Y.
Richmond Engineering Co., Inc., Richmond, Va.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Semet-Solvay Engineering Corp., New York, N. Y.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Staples & Pfeiffer, San Francisco, Calif.
Struthers Wells Corp., Titusville, Pa.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
Trent Co., Harold E., Philadelphia, Pa.
Vulcan Electric Co., Danvers, Mass.
Warren Electric Appliance Co., Warren, Pa.
● Whitlock Mfg. Co., Hartford, Conn.
Wiegand Co., Edwin L., Pittsburgh, Pa.
Zallea Brothers & Johnson, Wilmington, Del.

### PREHEATERS AND STRESS RELIEVERS, ELECTRIC, FOR PIPE WELDS

Electric Arc, Inc., Newark, N. J.
Falcon Equipment Co., New Brighton, Pa.
Hynes Electric Heating Co., Camden, N. J.
Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City, Mich.
Trent Co., Harold E., Philadelphia, Pa.

### PRE-INSULATED PIPE
*See Pipe, Pre-Insulated*

### PRESSURE BLOWERS
*See Blowers, High Pressure*

### PRESSURE CONTROLLERS
*See Regulators, Pressure*

### PRESSURE GAGES
*See Gages, Indicating, Pressure*

### PRESSURE INDICATOR-CONTROLLERS
*See Indicator-Controllers, Pressure*

### PRESSURE RECORDER-CONTROLLERS
*See Recorder-Controllers, Pressure*

### PRESSURE RECORDERS
*See Recorders, Pressure and Vacuum*

### PRESSURE REDUCING VALVES
*See Valves, Pressure Reducing and Regulating*

### PRESSURE REGULATING VALVES
*See Valves, Pressure Reducing and Regulating*

### PRESSURE REGULATORS
*See Regulators, Pressure*

### PRESSURE SWITCHES
*See Switches, Pressure and Vacuum*

### PROCESS HEATING SYSTEMS
*See Systems, Process Heating, High Temperature*

### PROCESS STEAM SUPERHEATERS
*See Superheaters, Process Steam*

### PROCESS AND STORAGE TANKS
*See Tanks, Process and Storage*

### PROPELLER FANS
*See Fans, Propeller*

### PROPORTIONING PUMPS
*See Pumps, Proportioning*

### PROTECTIVE COATINGS
*See Coatings, Protective, for Metal*

### PROTECTORS, PIPE COVERING

● American District Steam Co., North Tonawanda, N. Y.
Carpenter & Paterson, Inc., East Boston, Mass.
● Grant Wilson, Inc., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
● Ric-wiL Co., Cleveland, O.
● Wilson, Inc., Grant, Chicago, Ill.

### PSYCHROMETERS, SLING AND HAND ASPIRATED

American Moistening Co., Providence, R. I.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
G. M. Mfg. Co., New York, N. Y.
General Scientific Equipment Co., Philadelphia, Pa.
● Grinnell Co., Inc., Providence, R. I.
H-B Instrument Co., Philadelphia, Pa.
Hill, E. Vernon, Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Parks-Cramer Co., Fitchburg, Mass.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.

### PSYCHROSTATS
*See Humidistats*

### PULLEYS AND SHEAVES, FOR BELT DRIVES

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Browning Mfg. Co., Inc., Maysville, Ky.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Dayton Rubber Mfg. Co., Dayton, O.
Dick Co., Inc., R. & J., Passaic, N. J. (Steel split)
Doall Co., The, Des Plaines, Ill.
Gates Rubber Co., The, Denver, Colo.
Goldens' Foundry & Machine Co., Columbus, Ga. (Cast iron)
Ideal Commutator Dresser Co., Sycamore, Ill.
● Lau Blower Co., Dayton, O.
Lewellen Mfg. Co., Columbus, Ind.
● Maurey Mfg. Corp., Chicago, Ill.
Mayne Products Co., Dayton, O. (Variable speed)
Pyott Foundry & Machine Co., Chicago, Ill.
Rockwood Mfg. Co., Indianapolis, Ind.
Scientific Tool Co., Dayton O. (variable pitch)

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Swift Mfg. Co., Detroit, Mich. (Cast iron)
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Utility Appliance Corp., Los Angeles, Calif.
Wood's Sons Co., T. B., Chambersburg, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PULVERIZED COAL BURNERS

*See Burners, Pulverized Coal*

## PUMP BASES

*See Bases and Pads, Vibration Isolating*

## PUMP VALVES

*See Valves, Pump*

## PUMPS, BOILER FEED

Acker Organization, Inc., W. M., Cleveland, O.
Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
● Decatur Pump Co., Decatur, Ill.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Eagan Co., Walter H., Philadelphia, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
● Frederick Iron & Steel Co., Frederick, Md.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Johnson Corp., Three Rivers, Mich.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Morris Machine Works, Baldwinsville, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Robbins & Myers, Inc., Springfield, O.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sellers Engineering Co., Chicago, Ill.
Skidmore Corp., St. Joseph, Mich.
● Sterling, Inc., Milwaukee, Wis.
Stout & Sons, David, St. Louis, Mo.
Swaby Mfg. Co., Chicago, Ill.
Templeton Bros., Inc., Walpole, Mass.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Westco Pumps, Fairbanks, Morse & Co., St. Louis, Mo.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, CENTRIFUGAL

Aldrich Pump Co., Allentown, Pa.
Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
American Well Wks., Aurora, Ill.
● Ames Hydrovac Corp., Brooklyn, N. Y.
Aurora Pump Co., Aurora, Ill.
Barrett, Haentjens & Co., Hazleton, Pa.
Beach-Russ Co., New York, N. Y.
Beckett & Co., Thomas, Dallas, Tex.
● Bell & Gossett Co., Morton Grove, Ill.
Blaisdell Compressor Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chain Belt Co., Milwaukee, Wis.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
● Decatur Pump Co., Decatur, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dunham Co., C. A., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
● Frederick Iron & Steel Co., Frederick, Md.
Fulflo Specialties Co., Inc., The, Blanchester, O.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
La Bour Co., Inc., The, Elkhart, Ind.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Lewis & Co., Inc., Chas. S., St. Louis, Mo.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard hubber)
Morris Machine Works, Baldwinsville, N. Y.
Myers & Bro. Co., F. E., The, Ashland, O.
● Nash Engineering Co., South Norwalk, Conn.
National Carbon Co., New York, N. Y.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Palmer Electric Co., Detroit, Mich.
● Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Schneible Co., Claude B., Detroit, Mich.
Schwitzer-Cummins Co., Indianapolis, Ind.
Skidmore Corp., St. Joseph, Mich.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Buffalo, N. Y.
Templeton Bros., Inc., Walpole, Mass.
● Trane Co., The, La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Utility Appliances Corp., Los Angeles, Calif.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Westco Pumps, Fairbanks, Morse & Co., St. Louis, Mo.
Whittington Pump & Engineering Co., Indianapolis, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, CONDENSATION RETURN

Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
● Ames Hydrovac Corp., Brooklyn, N. Y.
Aurora Pump Co., Aurora, Ill.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.
Cochrane Corp., Philadelphia, Pa.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
● Decatur Pump Co., Decatur, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dunham Co., C. A., Chicago, Ill.
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
● Frederick Iron & Steel Co., Frederick, Md.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Heating Assurance, Inc., Spokane, Wash.
● Hoffman Specialty Co., Indianapolis, Ind.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Johnson Corp., Three Rivers, Mich.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Lewis & Co., Inc., Chas. S., St. Louis, Mo.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
● Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
O'Brien Steam Specialty Co., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sellers Engineering Co., Chicago, Ill.
Skidmore Corp., St. Joseph, Mo.
● Sterling, Inc., Milwaukee, Wis.
Stout & Sons, David, St. Louis, Mo.
Swaby Mfg. Co., Chicago, Ill.
Templeton Bros., Inc., Walpole, Mass.

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● Trane Co., The, La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Westco Pumps, Fairbanks, Morse & Co., St. Louis, Mo.
Whittington Pump & Engineering Co., Indianapolis, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, DEEP WELL, TURBINE

American-Marsh Pumps, Inc., Battle Creek, Mich.
American Well Wks., Aurora, Ill.
Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Cook, Inc., A. D., Lawrenceburg, Ind.
Davidson Co., M. T., Brooklyn, N. Y.
Deming Co., Salem, O.
● Eagan Co., Walter H., Philadelphia, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Layne & Bowler, Inc., Memphis, Tenn.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Pacific Pump Works, Huntington Park, Calif.
● Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.
Pomona Pumps, Fairbanks, Morse & Co., Pomona, Calif.
Red Jacket Mfg. Co., Davenport, Ia.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PUMPS, FIRE

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Blackmer Pump Co., Grand Rapids, Mich.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Dayton-Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Lecourtenay Co., Newark, N. J.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
Myers & Bro. Co., F. E., The, Ashland, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Pomona Pumps, Fairbanks, Morse & Co., Pomona, Calif.
Viking Pump Co., Cedar Falls, Ia.
Warren Steam Pump Co., Inc., Warren, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PUMPS, LIQUID REFRIGERANT CIRCULATING

Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Lewis & Co., Chas. S., St. Louis, Mo.
Red Jacket Mfg. Co., Davenport, Ia.
Roper Corp., Geo. D., Rockford, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
Warren Steam Pump Co., Inc., Warren, Mass.
Weinman Pump Mfg. Co., Columbus, O.
Westco Pumps, Fairbanks, Morse & Co., St. Louis, Mo.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PUMPS, PROPORTIONING

Cochrane Corp., Philadelphia, Pa.
Dearborn Chemical Co., Chicago, Ill.
Eastern Engineering Co., New Haven, Conn.
Haering Co., Inc., D. W., Chicago, Ill.
Jabsco Pump Co., Beverly Hills, Calif.
Nelson Chemical Pumps, Casper, Wyo.
% Proportioneers, Inc. %, Providence, R. I.
Roy Pumps, Milton, Philadelphia, Pa.
Wallace & Tiernan Co., Inc., Newark, N. J.

## PUMPS, RECIPROCATING

Aldrich Pump Co., Allentown, Pa.
Alten's Foundry & Machine Works, Lancaster, O.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Columbus Steam Pump Wks., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Deming Co., Salem, O.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Duro Co., Dayton, O.
● Eagan Co., Walter H., Philadelphia, Pa.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pumps Wks., Inc., Brooklyn, N. Y.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Homestead Valve Mfg. Co., Coraopolis, Pa.
● Ingersoll-Rand Co., New York, N. Y.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Myers & Bro. Co., F. E., The, Ashland, O.
National Steam Pump Co., Upper Sandusky, O.
Red Jacket Mfg. Co., Davenport, Ia.
Roy Pumps, Milton, Philadelphia, Pa.
Uniflow Mfg. Co., Erie, Pa.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Watson-Stillman Co., Roselle, N. J.
Worthington Pump & Machinery Corp., Harrison, N. J.
Zenith Associates, Newton, Mass.

## PUMPS, ROTARY

Allen Billmyre Co., Mamaroneck, N. Y.
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Beach-Russ Co., New York, N. Y.
Blackmer Pump Co., Grand Rapids, Mich.
Bowser, Inc., Fort Wayne, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lammert & Mann Co., Chicago, Ill.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
● Martocello & Co., Jos. A., Philadelphia, Pa.
● May Oil Burner Corp., Baltimore, Md.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
● Nash Engineering Co., South Norwalk, Conn.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
● Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Robbins & Myers, Inc., Springfield, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
St. Louis Tool Co., St. Louis, Mo.
Schutte & Koerting Co., Philadelphia, Pa.
Scott-Newcomb, Inc., St. Louis, Mo.
Sundstrand Machine Tool Co., Pump Div., Rockford, Ill.
Taber Pump Co., Buffalo, N. Y.
Trimount Rotary Power Co., East Dedham, Mass.
Tuthill Pump Co., Chicago, Ill.
Viking Pump Co., Cedar Falls, Ia.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yale & Towne Mfg. Co., Stamford, Conn.

## PUMPS, SEWAGE AND SLUDGE

American-Marsh Pumps, Inc., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Works, Oswego, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Swaby Mfg. Co., Chicago, Ill.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, STEAM

American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
● Eagan Co., Walter H., Philadelphia, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
National Steam Pump Co., Upper Sandusky, O.
Templeton Bros., Inc., Walpole, Mass.

● **Advertisement in this issue. See Index to Advertisers, page 350.**

Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Watson-Stillman Co., Roselle, N. J.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PUMPS, SUMP

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pneumatic Tool Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
Dean Hill Pump Co., Indianapolis, Ind.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
Duro Co., Dayton, O.
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Economy Pumps, Inc., Hamilton, O.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
● Frederick Iron & Steel Co., Frederick, Md.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
● Ingersoll-Rand Co., New York, N. Y.
Jabsco Pump Co., Beverly Hills, Calif.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Lawrence Pump & Engine Co., Lawrence, Mass.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
Myers & Bro. Co., F. E., The, Ashland, O.
● Nash Engineering Co., South Norwalk, Conn.
Noera Mfg. Co., Div. Chase Brass & Copper Co., Waterbury, Conn.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
● Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.
Penberthy Injector Co., Detroit, Mich.
Pomona Pumps, Fairbanks, Morse & Co., Pomona, Calif.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Schneible Co., Claude B., Detroit, Mich.
Schutte & Koerting Co., Philadelphia, Pa.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Buffalo, N. Y.
Triplex Heating Specialty Co., Peru, Ind.
Uniflow Mfg. Co., Erie, Pa.
Union Steam Pump Co., Battle Creek, Mich.
Wade Mfg. Co., Elgin, Ill.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Westco Pumps, Fairbanks, Morse & Co., St. Louis, Mo.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, VACUUM

Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Automatic Typewriter Co., Chicago, Ill.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
Beach-Russ Co., New York, N. Y.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
● Dunham Co., C. A., Chicago, Ill.
Economy Pumps, Inc., Hamilton, O.
Eisler Engineering Corp., Newark, N. J.
Elliott Co., Jeannette, Pa.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Foster Wheeler Corp., New York, N. Y.
Fuller Co., Catasauqua, Pa.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lammert & Mann Co., Chicago, Ill.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O
● Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Skidmore Corp., St. Joseph, Mich.
Trimount Rotary Power Co., East Dedham, Mass.
Union Steam Pump Co., Battle Creek, Mich.
Viking Pump Co., Cedar Falls, Ia.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.
Whittington Pump & Engineering Co., Indianapolis, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUMPS, VACUUM HEATING

American-Marsh Pumps, Inc., Battle Creek, Mich.
● Ames Hydrovac Corp., Brooklyn, N. Y.
Beach-Russ Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dunham Co., C. A., Chicago, Ill.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
Gylstrom Co., O., Milwaukee, Wis.
● Hoffman Specialty Co., Indianapolis, Ind.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
● Nash Engineering Co., South Norwalk, Conn.
Roots-Connersville Blower Corp., Connersville, Ind.
Skidmore Corp., St. Joseph, Mich.
● Sterling, Inc., Milwaukee, Wis.
Stout & Sons, David, St. Louis, Mo.
Templeton Bros., Inc., Walpole, Mass.
● Trane Co., The, LaCrosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Whittington Pump & Engineering Co., Indianapolis, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

## PUMPS, VISCOUS LIQUIDS AND HEAVY MATERIALS

Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
Beach-Russ Co., New York, N. Y.
Blackmer Pump Co., Grand Rapids, Mich.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Engineer Co., New York, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
● Frederick Iron & Steel Co., Frederick, Md.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand Co., New York, N. Y.
Jabsco Pump Co., Beverly Hills, Calif.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lawrence Pump & Engine Co., Lawrence, Mass.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Robbins & Myers, Inc., Springfield, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
Roy Pumps, Milton, Philadelphia, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Taber Pump Co., Buffalo, N. Y.
Tuthill Pump Co., Chicago, Ill.
Union Steam Pump Co., Battle Creek, Mich.
Viking Pump Co., Cedar Falls, Ia.
Warren Steam Pump Co., Inc., Warren, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

## PUNCHES, SHEET METAL

Beatty Machine & Mfg. Co., Hammond, Ind.
Bertsch & Co., Inc., Cambridge City, Ind.
Bliss Co., E. W., Toledo, O.
C-B Tool Co., Lancaster, Pa.
Callahan Can Machine Co., Inc., Brooklyn, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Greenlee Tool Co., Div. of Greenlee Bros. & Co., Rockford, Ill.
Heartley Machine & Tool Co., Toledo, O.
Hendley & Whittemore Co., Beloit, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.
International Nutyp Tool Co., Oswego, N. Y.
Kidder Mfg. Co., Inc., J. F., Burlington, Vt.
New Albany Machine Mfg. Co., New Albany, Ind.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Parker-Kalon Corp., New York, N. Y.

● Advertisement in this issue. See Index to Advertisers, page 350.

Peck, Stow & Wilcox Co., Southington, Conn.
Perkins Machine Co., Warren, Mass.
Rock River Machine Co., Inc., Janesville, Wis.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
Service Machine Co., Elizabeth, N. J.
Swaine Mfg. Co., Fred J., St. Louis, Mo.
Whitney Mfg. Co., W. A., Rockford, Ill.
Whitney Metal Tool Co., Rockford, Ill.
Wiedemann Machine Co., Philadelphia, Pa.
Zeh & Hahnemann Co., Newark, N. J.

## PURGERS, REFRIGERANT GAS

● Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Vilter Mfg. Co., Milwaukee, Wis.

## RADIANT HEAT THERMOSTATS

*See Thermostats, Radiant Heat*

## RADIATION, CONVECTION TYPE, FERROUS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Beacon-Morris Corp., Boston, Mass.
Burnham Boiler Corp., Irvington, N. Y.
● Crane Co., Chicago, Ill.
● Dunham Co., C. A., Chicago, Ill.
● Marlo Coil Co., St. Louis, Mo.
● Murray Mfg. Co., D. J., Wausau, Wis.
National Radiator Co., The, Johnstown, Pa.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
● Smith Co., Inc., The, H. B., Westfield, Mass.
● Trane Co., The, La Crosse, Wis.
United States Radiator Corp., Detroit, Mich.
Utica Radiator Corp., Utica, N. Y.
● Vulcan Radiator Co., Hartford, Conn.
Weil-McLain Co., Chicago, Ill.
● Young Radiator Co., Racine, Wis.

## RADIATION, CONVECTION TYPE, NON-FERROUS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Beacon-Morris Corp., Boston, Mass.
● Bush Mfg. Co., Hartford, Conn.
● Dunham Co., C. A., Chicago, Ill.
● Extended Surface, Inc., Brooklyn, N. Y.
● G. & O. Mfg. Co., New Haven, Conn.
Kehm Corp., The., Chicago, Ill.
McQuay, Inc., Minneapolis, Minn.
● Modine Mfg. Co., Racine, Wis.
Refrigeration Economics Co., Inc., Canton, O.
Rome-Turney Radiator Co., Rome, N. Y.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Super Radiator Corp., Minneapolis, Minn.
● Trane Co., The, La Crosse, Wis.
● Tuttle & Bailey, Inc., New Britain, Conn.
Vapor Car Heating Co., Inc., Chicago, Ill.
● Vulcan Radiator Co., Hartford, Conn.
● Young Radiator Co., Racine, Wis.

## RADIATION, DIRECT

American Radiator & Standard Sanitary Corp., Pittsburgn, Pa.
Burnham Boiler Corp., Irvington, N. Y.
● Clifford Mfg. Co., Boston, Mass. (for aircraft)
Clow & Sons, James B., Chicago, Ill. (Gas fired)
Columbia Radiator Co., McKeesport, Pa.
● Crane Co., Chicago, Ill.
Fowler & Wolfe Radiator Co., Norristown, Pa.
Kohler Co., Kohler, Wis.
● Murray Mfg. Co., D. J. Wausau, Wis.
National Radiator Co., The, Johnstown, Pa.
Slater Mfg. Co., Wakefield, Mass. (Baseboard)
● Smith Co., Inc., H. B., The, Westfield, Mass.
Thatcher Furnace Co., Garwood, N. J.
United States Radiator Corp., Detroit, Mich.
Utica Radiator Corp., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

## RADIATOR AND CONVECTOR HUMIDIFIERS

*See Humidifiers for Radiators and Convectors*

## RADIATOR HANGERS

*See Hangers or Brackets, Radiator*

## RADIATOR ORIFICE VALVES

*See Valves, Radiator, Orifice*

## RADIATOR ORIFICES

*See Orifices, Radiator*

## RADIATOR VALVES

*See Valves, Radiator*

## RADIATOR VENT VALVE HUMIDIFIERS

*See Humidifiers, Radiator Vent Valve*

## RADIATORS, GAS FIRED

Automatic Gas Equipment Co., Pittsburgh, Pa.

## RADIATORS, HUMIDIFYING

Burnham Boiler Corp., Irvington, N. Y.
● Murray Mfg. Co., D. J. Wausau, Wis.
Utica Radiator Corp., Utica, N. Y.

## RATCHET WRENCHES

*See Wrenches, Ratchet*

## REAMERS, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Crown Die & Tool Co., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Nye Tool & Machine Co., Chicago, Ill.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.

## RECIPROCATING PUMPS

*See Pumps, Reciprocating*

## RECORDER-CONTROLLERS, COMBINED TEMPERATURE AND HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Ess Instrument Co., Fort Lee, N. J.
Foxboro Co., Foxboro, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

## RECORDER-CONTROLLERS, HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

## RECORDER-CONTROLLERS, PRESSURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

## RECORDER-CONTROLLERS, TEMPERATURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Eimer & Amend, New York, N. Y.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● Powers Regulator Co., Chicago, Ill.
Pyrometer Instrument Co., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

## RECORDERS, CARBON DIOXIDE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Defender Instrument and Regulator Co., St. Louis, Mo.
Engelhard, Inc., Charles, Newark, N. J.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Precision Control Co., San Francisco, Calif.
Republic Flow Meters Co., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Uehling Instrument Co., Paterson, N. J.

## RECORDERS, COMBINED TEMPERATURE AND HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co, Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.

## RECORDERS, DRAFT

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Republic Flow Meters Co., Chicago, Ill.
Uehling Instrument Co., Paterson, N. J.
Wheelco Instruments Co., Chicago, Ill.

## RECORDERS, HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
H-B Instrument Co., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

## RECORDERS, LIQUID LEVEL

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Cochrane Corp., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Liquidometer Corp., Long Island City, N. Y.
Mason-Neilan Regulator Co., Boston, Mass.
Morey & Jones, Ltd., Los Angeles, Calif.
Republic Flow Meters Co., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## RECORDERS, PRESSURE AND VACUUM

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Cochrane Corp., Philadelphia, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Uehling Instrument Co., Paterson, N. J.
United States Gauge Co., Sellersville, Pa.
Weksler Thermometer Corp., New York, N. Y.

## RECORDERS, TEMPERATURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Cochrane Corp., Philadelphia, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Engelhard, Inc., Charles, Newark, N. J.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
● Powers Regulator Co., Chicago, Ill.
Practical Instrument Co., Chicago, Ill.
Precision Scientific Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York, N. Y.
Pyrometer Instrument Co., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.
Wheelco Instruments Co., Chicago, Ill.

## RECORDING THERMOMETERS

*See Recorders, Temperature*

## RECOVERY EQUIPMENT, AIR

*See Adsorbers, Odor*

## REDUCERS, SPEED

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Bodine Electric Co., Chicago, Ill.
Boston Gear Wks., Inc., North Quincy, Mass.
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Graham Transmissions, Inc., Milwaukee, Wis.
Ideal Commutator Dresser Co., Sycamore, Ill.
● Janette Mfg. Co., Chicago, Ill. (Motorized)
Jones Foundry & Machine Co., W. A., Chicago, Ill.
● Link Belt Co., Philadelphia, Pa.
Medart Co., St. Louis, Mo.
Moore Steam Turbine Div., Worthington Pump & Machinery Corp., Wellsville, N. Y.
Morse Chain Co., Ithaca, N. Y. (Chain speed).
Philadelphia Gear Works, Inc., Philadelphia, Pa.
Poole Foundry & Machine Co., Baltimore, Md.
Smith, Inc., Winfield H., Springville, N. Y.
● Star Electric Motor Co., Bloomfield, N. J.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## REFRACTORIES AND REFRACTORY CEMENT

Babcock & Wilcox Co., New York, N. Y.
Bird-Archer Co., Philadelphia, Pa.
Botfield Refractories Co., Philadelphia, Pa.
Chicago Fire Brick Co., Chicago, Ill.
Commonwealth Products Co., Philadelphia, Pa.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Fireline Stove & Furnace Lining Co., Chicago, Ill
General Insulating Products Co., Brooklyn, N. Y.
Gilbert & Son, Harry E., Bridgeport, Conn.
Green Fire Brick Co., A. P., Mexico, Mo.
Johns-Manville, New York, N. Y.
Krehbiel Co., J. H., Chicago, Ill.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Ludowici-Celadon Co., Chicago, Ill. (insulating)
McLeod & Henry Co., Inc., Troy, N. Y.
Munn and Steele, Inc., Newark, N. J.
Plibrico Jointless Firebrick Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York, N. Y.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Ramtite Co., The, Chicago, Ill.
Refractory & Insulation Corp., New York, N. Y.
Rex Clay Products Co., Detroit, Mich.
Ruberoid Co., New York, N. Y.
● Rutland Fire Clay Co., Rutland, Vt.
Standard Fuel Engineering Co., Detroit, Mich.
Taylor Sons Co., Charles, Cincinnati, O.
United States Stoneware Co., New York, N. Y.
Universal Zonolite Insulation Co., Chicago, Ill.
Walsh Refractories Corp., St. Louis, Mo.

## REFRIGERANT DEHYDRATORS

*See Dehydrators, Refrigerant*

● **Advertisement** in this issue. See Index to Advertisers, page 350.

## REFRIGERANT GAS PURGERS

*See Purgers, Refrigerant Gas*

## REFRIGERANTS

Ansul Chemical Co., Marinette, Wis. (methyl chloride, sulphur dioxide)
Armour Ammonia Wks., Chicago, Ill. (ammonia)
Carbide and Carbon Chemicals Corp., New York, N. Y. (Butane, isobutane, propane, ethane)
du Pont de Nemours & Co., Inc., E. I., Ammonia Dept., Wilmington, Del. (ammonia, sulphur dioxide, methyl chloride, "Freon-12")
du Pont de Nemours & Co., Inc., E. I., Electrochemicals Dept., Wilmington, Del. (methyl chloride and methylene chloride, $SO_2$ trichlorethylene)
Kinetic Chemicals, Inc., Wilmington, Del. ("Freon," fluorine)
Liquid Carbonic Corp., Chicago, Ill. (carbon dioxide)
Pennsylvania Salt Mfg. Co., Philadelphia, Pa. (ammonia)
Pure Carbonic, Inc., New York, N. Y. (carbon dioxide)
Solvay Sales Corp., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va. (Methyl chloride, liquid sulphur dioxide, methylene chloride)

## REFRIGERATING COMPRESSORS

*See Compressors, Refrigerating*

## REFRIGERATION ACCUMULATORS

*See Accumulators, Refrigeration*

## REFRIGERATION CONTROLS

*See Valves, Refrigeration*

## REFRIGERATION FITTINGS

*See Fittings, Refrigeration*

## REFRIGERATION MANIFOLDS

*See Manifolds, Refrigeration*

## REFRIGERATION VALVES

*See Valves, Refrigeration*

## REGISTERS

*See also Diffusers; Grilles; Panels, Perforated, for Air Diffusion*

A-J Mfg. Co., Kansas City, Mo.
Air Control Products, Inc., Coopersville, Mich.
Air-O-Fin Register Co., Detroit, Mich.
● Auer Register Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Best Register Co., Milwaukee, Wis.
Char-Gale Mfg. Co., Minneapolis, Minn.
Diamond Mfg. Co., Wyoming, Pa.
Eaglesfield Ventilator Co., Indianapolis, Ind. (wood)
Elsey Metal Specialties Co., Detroit, Mich.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Hart & Cooley Mfg. Co., Holland, Mich.
Hendrick Mfg. Co., Carbondale, Pa.
Henry Furnace Co., The, Medina, O.
Independent Register Co., Cleveland, O.
Knowles Mushroom Ventilator Co., Montclair, N. J.
Lamneck Products, Inc., Middletown, O.
Middleton Mfg. & Sales Co., Minneapolis, Minn.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Newman Bros., Inc., Cincinnati, O.
● Palmer Mfg. Corp., Phoenix, Ariz.
Register & Grille Mfg. Co., Brooklyn, N. Y.
Rock Island Register Co., Rock Island, Ill.
Standard Stamping & Perforating Co., Chicago, Ill.
Stewart Mfg. Co., Bloomfield, N. J.
● Tuttle & Bailey, Inc., New Britain, Conn.
United States Register Co., Battle Creek, Mich.
Waterloo Register Co., Waterloo, Ia.

## REGULATORS, AIR VELOCITY

● Barber-Colman Co., Rockford, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Wheelco Instruments Co., Chicago, Ill.

## REGULATORS, DAMPER SETS

Adams Co., The, Dubuque, Ia.
Air Control Products, Inc., Coopersville, Mich.
● Automatic Products Co., Milwaukee, Wis.
Badger Corp., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Cole-Sullivan Engineering Co., Minneapolis, Minn.
Fossum, M. H., St. Paul, Minn.
Gerett Corp., M. A., Milwaukee, Wis.
Goese Mfg. Co., Milwaukee, Wis.
Hart & Cooley Mfg. Co., Holland, Mich.
Joal Mfg. Corp., Toledo, O.
Kerentoff, G. L., Cincinnati, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Northern Weatherstrip Co., Duluth, Minn.
Ohio Products Co., Cleveland, O.
Parker-Kalon Corp., New York, N. Y.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Sampsel Time Control, Inc., Spring Valley, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
United States Register Co., Battle Creek, Mich.
Young Regulator Co., Cleveland, O.

## REGULATORS, DRAFT, COMBUSTION

Askania Regulator Co., Chicago, Ill.
● Au-Temp-Co Corp., New York, N. Y.
Automatic Products Co., Milwaukee, Wis.
Bailey Meter Co., Cleveland, O.
Boiler Room Equipment, Inc., New York, N. Y.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Burrows Mfg. Co., F. A., York, Pa.
● Cash Co., A. W., Decatur, Ill.
Cole-Sullivan Engineering Co, Minneapolis, Minn.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Engineer Co., New York, N. Y.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
Hagan Corp., Pittsburgh, Pa.
● Hays Corp., Michigan City, Ind.
Hotstream Heater Co., Cleveland, O
● Illinois Engineering Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Leeds & Northrup Co., Philadelphia, Pa.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
Master Electric Co., Dayton, O.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Brass Co., Grand Rapids, Mich.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
Precision Control Co., San Francisco, Calif.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill. (Industrial)
Ruggles-Klingeman Mfg. Co., Salem, Mass.
Sampsel Time Control, Inc., Spring Valley, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y
● Webster Engineering Co., Tulsa, Okla.
Wheelco Instruments Co., Chicago, Ill.

## REGULATORS, PRESSURE, AIR

American Meter Co., Inc., New York, N. Y.
Askania Regulator Co., Chicago, Ill.
Atlas Valve Co., Inc., Newark, N. J.
● Barber-Colman Co., Rockford, Ill.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Brooke Engineering Co., Inc., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cooper Co, Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
DeVilbiss Co., The, Toledo, O.
Dockson Corp., Detroit, Mich.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
● Fulton Sylphon Co., The, Knoxville, Tenn.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
Hotstream Heater Co., Cleveland, O.
● Illinois Engineering Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
North Penn Co., New York, N. Y.
● Penn Electric Switch Co., Goshen, Ind.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Spray Engineering Co., Somerville, Mass.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Strong, Carlisle & Hammond Co., Cleveland, O.

● Advertisement in this issue. See Index to Advertisers, page 350.

Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Tryco Products, Inc., Westfield, Mass.
United Electric Controls Co., Boston, Mass.
Victor Equipment Co., San Francisco, Calif.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.

## REGULATORS, PRESSURE, GAS

American Meter Co., Inc., New York, N. Y.
Askania Regulator Co., Chicago, Ill.
Atlas Valve Co., Inc., Newark, N. J.
● Barber-Colman Co., Rockford, Ill.
Barber Gas Burner Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Dockson Corp., Detroit, Mich.
Eclipse Fuel Engineering Co., Rockford, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Fox Control & Mfg. Co., Cleveland, O.
Foxboro Co., Foxboro, Mass.
● General Controls Co., Glendale, Calif.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
● Illinois Engineering Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Liquid Carbonic Corp., The, Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Col.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
● Powers Regulator Co., Chicago, Ill.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill. (Industrial)
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Square D Co., Detroit, Mich.
Staples & Pfeiffer, San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Victor Equipment Co., San Francisco, Calif.
Wall Chemicals Div. of The Liquid Carbonic Corp., Chicago, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.

## REGULATORS, PRESSURE, HOT WATER HEATING SYSTEMS

● Barber-Colman Co., Rockford, Ill.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chicago Specialty Mfg. Co., Chicago, Ill.
● Fisher Governor Co., Marshalltown, Ia.
● Illinois Engineering Co., Chicago, Ill.
Kainer Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Mueller Co., Decatur, Ill.
Penberthy Injector Co., Detroit, Mich.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.

## REGULATORS, PRESSURE, LIQUID

Atlas Valve Co., Inc., Newark, N. J.
Automatic Control Co., St. Paul, Minn.
Bailey Meter Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg Co., Pittsburgh, Pa.
Clark Controller Co., Cleveland, O.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
General Sales & Products Co., Cohoes, N. Y.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
Healy Ruff Co., St. Paul, Minn.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Justus Steam Trap Co., Napanoch, N. Y.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
Perfex Corp., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Staples & Pfeiffer, San Francisco, Calif.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Tryco Products, Inc., Westfield, Mass.
United Electric Controls Co., Boston, Mass.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.
Williams Gauge Co., Pittsburgh, Pa. (Feed water)

## REGULATORS, STATIC PRESSURE, AIR DUCT

● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
● Cash Co., A. W., Decatur, Ill.
● Hays Corp., Michigan City, Ind.
Hotstream Heater Co., Cleveland, O.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.

## REGULATORS, TEMPERATURE

American Instrument Co., Silver Spring, Md.
American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
● Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Burling Instrument Co., Newark, N. J.
Cook Electric Co., Chicago, Ill.

● **Advertisement in this issue. See Index to Advertisers, page 350.**

Cooper Co., Clark, Palmyra, N. J.
Defender Instrument and Regulator Co., St. Louis, Mo.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
Eastern Engineering Co., New Haven, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
● Electrimatic Div., The, of the Simoniz Co., Chicago Ill.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
H-B Instrument Co., Philadelphia, Pa.
Hagan Corp., Pittsburgh, Pa.
Hart Mfg. Co., The, Hartford, Conn.
● Hays Corp., Michigan City, Ind.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Keckley Co., O. C., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Lawler Automatic Controls, Mount Vernon, N. Y.
● Leeds & Northrup Co., Philadelphia, Pa.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Marsh Corp., Jas. P., Chicago, Ill.
Marsh Tritrol Co., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., Chicago, Ill.
Miller Heat-O-Meter Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Pyrometer Instrument Co., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Spence Engineering Co., Inc., Walden, N. Y.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., Detroit, Mich.
● Sterling, Inc., Milwaukee, Wis.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

## RELAYS, ELECTRICAL

Advance Electric and Relay Co., Los Angeles, Calif.
Allen-Bradley Co., Milwaukee, Wis.
American Instrument Co., Silver Spring, Md.
Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
● Au-Temp-Co Corp., New York, N. Y.
Automatic Switch Co., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
B/W Controller Corp., Birmingham, Mich.
● Barber-Colman Co., Rockford, Ill.
Bardco Mfg. & Sales Co., Los Angeles, Calif.
Benjamin Electric Mfg. Co., Des Plaines, Ill.
Clark Controller Co., Cleveland, O.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Cook Electric Co., Chicago, Ill.
Cooper Co., Clark, Palmyra, N. J.
Cramer Co., Inc., R. W., The, Centerbrook, Conn.
Cutler-Hammer, Inc., Milwaukee, Wis.
Davis & Co., Inc., Dean W., Kentland, Ind.
● Detroit Lubricator Co., Detroit, Mich.
Dunn, Inc., Struthers, Philadelphia, Pa.
Durakool, Inc., Elkhart, Ind.
Eastern Air Devices, Inc., Brooklyn, N. Y.
Edison, Inc., Thos. A., Instrument Div., West Orange, N. J.
Ess Instrument Co., Fort Lee, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Gleason-Avery, Inc., Auburn, N. Y.
Guardian Electric Mfg. Co., Chicago, Ill.
H-B Instrument Co., Philadelphia, Pa.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monitor Controller Co., The, Baltimore, Md.
National Time & Signal Corp., Detroit, Mich.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Reynolds Electric Co., Chicago, Ill.
Rhodes, Inc., M. H., Hartford, Conn. (time delay)
Sampsel Time Control, Inc., Spring Valley, Ill.
Small Motors, Inc., Chicago, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., Milwaukee, Wis.
Struthers Dunn, Inc., Philadelphia, Pa.
Synchro-Start Products, Chicago, Ill.
● Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
Triplex Heating Specialty Co., Peru, Ind.
● Ward Leonard Electric Co., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa
Weston Electrical Instrument Corp., Newark, N. J.
Zenith Electric Co., Chicago, Ill.

## RELIEF VALVES

*See Valves, Relief*

## REPAIR CLAMPS

*See Clamps, Pipe Repair*

## RESEATERS, VALVE

Chicago Specialty Mfg. Co., Chicago, Ill.
Economy Valve Seat Co., Chicago, Ill.
Leavitt Machine Co., Orange, Mass.
Standard Reseater Corp., New York, N. Y.

## RINGS, PISTON, FOR COMPRESSORS

American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.
McQuay-Norris Mfg. Co., St. Louis, Mo.
Perfect Circle Co., The, Hagerstown, Ind.
Perfection Refrigeration Parts Co., Harvey, Ill.
Sealed Power Corp., Muskegon, Mich.

## RINGS, WELDING

● Tube Turns, Louisville, Ky.
Wedge Protectors, Inc., Cleveland, O.

## ROD, GAS WELDING

● Air Reduction Sales Co., New York, N. Y.
● American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland, O.
Atlantic Steel Co., Atlanta, Ga.
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Steel & Wire Co., Chicago, Ill.
Crucible Steel Co. of America, New York, N. Y.
Dow Chemical Co., The, Midland, Mich.
Duraloy Co., Scottdale, Pa. (Stainless)
Eutectic Welding Alloys Co., New York, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
International Nickel Co., New York, N. Y.
Linde Air Products Co., The, Unit of Union Carbide & Carb Corp., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Marquette Mfg. Co., Minneapolis, Minn.
Maurath, Inc., Cleveland, O.
Milburn Co., Alexander, Baltimore, Md.
Modern Engineering Co., St. Louis, Mo.
National Cylinder Gas Co., Chicago, Ill.
Page Steel & Wire Division of American Chain & Inc., Monessen, Pa.
● Revere Copper and Brass, Incorporated, New York, N.
Torchweld Equipment Div., National Cylinder Gas Co., Ill.
Universal Power Corp., Cleveland, O.
Victor Equipment Co., San Francisco, Calif.
Wickwire Spencer Steel Co., New York, N. Y.
● Youngstown Sheet & Tube Co., Youngstown, O.

## ROLLER BEARINGS

*See Bearings, Roller*

## ROOF COOLERS

*See Systems, Roof Spraying*

## ROOF SPRAYING SYSTEMS

*See Systems, Roof Spraying*

## ROOF VENTILATORS

*See Ventilators, Roof*

## ROOM HUMIDIFIERS

*See Humidifiers, Unit, Room Type; and Units, Air Conditioning Winter*

## ROOM THERMOSTATS

*See Thermostats, Room or Wall*

## ROTARY PUMPS

*See Pumps, Rotary*

## RUBBER BELTING

*See Belting, Flat, Rubber*

## RUBBER PACKING

*See Packing, Rubber and Synthetic*

## RUBBER PIPE

*See Pipe, Hard Rubber*

## SADDLE VALVES

*See Valves, Saddle*

## SAFETY VALVES

*See Valves, Safety, Steam*

● Advertisement in this issue. See Index to Advertisers, page 350.

## SCREENS, SUN REFLECTING

Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.
Kane Mfg. Corp., Kane, Pa.
Yardley Screen & Weather Strip Co., Columbus, O.

## SEAMLESS PIPE

*See Pipe, Steel, Seamless*

## SEPARATORS, AIR

Adams Co., Inc., R. P., Buffalo, N. Y.
American Injector Co., Detroit, Mich.
● Bird-White Co., Chicago, Ill.
Bowser, Inc., Fort Wayne, Ind.
Centrifix Corp., Cleveland, O.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
DeVilbiss Co., The, Toledo, O.
● Dollinger Corp., Rochester, N. Y.
Hi-Steam Products, Inc., New York, N. Y.
Hagan Corp., Pittsburgh, Pa.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
Keckley Co., O. C., Chicago, Ill.
Leavitt Machine Co., Orange, Mass.
Logan Engineering Co., Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Spencer Turbine Co., Hartford, Conn.
Selby Engineering Co., Somerville, Mass.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Texite Corp., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Wright-Austin Co., Detroit, Mich.

## SEPARATORS, STEAM AND OIL

● Aero Industries, Inc., Jackson, Mich.
Adams Co., Inc., R. P., Buffalo, N. Y.
● American District Steam Co., North Tonawanda, N. Y.
Boylston Steam Specialty Co., Chicago, Ill.
Centrifix Corp., Cleveland, O. (Gas and vapor)
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Hi-Steam Products, Inc., New York, N. Y.
Elliott Co., Jeannette, Pa.
● Fisher Governor Co., Marshalltown, Ia.
Frick Co., Waynesboro, Pa.
Hagan Corp., Pittsburgh, Pa.
Hoppes Mfg. Co., Springfield, O.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kisco Boiler & Engineering Co., St. Louis, Mo.
● McAlear Mfg. Co., Chicago, Ill.
Morehead Mfg. Co., Detroit, Mich.
National Valve & Mfg. Co., Pittsburgh, Pa.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., Erie, Pa.
Steele Steam Specialties Co., Indianapolis, Ind.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Temprite Products Corp., Detroit, Mich.
Texite Corp., Chicago, Ill.
● Webster & Co., Warren, Camden, N. J.
Westfalia Separator Co., Bloomfield, N. J.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
Wright-Austin Co., Detroit, Mich.

## SEWAGE EJECTORS

*See Ejectors, Sewage*

## SEWAGE PUMPS

*See Pumps, Sewage*

## SHAFTS, FLEXIBLE, PUSH-PULL, FOR CONTROL

Arens Controls, Inc., Chicago, Ill.

## SHEARS, ELECTRIC, PORTABLE

Black & Decker Mfg. Co., Towson, Md.
C-B Tool Co., Lancaster, Pa.
G. D. S. Machinery & Supply Co., Inc., New York, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Stanley Electric Tools, Div. of The Stanley Works, New Britain, Conn.
Van Dorn Electric Tool Co., Towson, Md.
York Electric & Machine Co., York, Pa.

## SHEARS, POWER

Beatty Machine & Mfg. Co., Hammond, Ind.
Bertsch & Co., Inc., Cambridge City, Ind.
Bliss Co., E. W., Toledo, O.
● Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Heartley Machine & Tool Co., Toledo, O.
Hendley & Whittemore, Beloit, Wis.
Niagara Machine & Tool Wks., Buffalo, N. Y.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Quickwork Div., Whiting Corp., Harvey, Ill.
Rafter Machine Co., Belleville, N. J.
Rock River Machine Co., Inc., Janesville, Wis.
St. Louis Tool Co., St. Louis, Mo.
Whitney Metal Tool Co., Rockford, Ill.
Yoder Co., The, Cleveland, O.

## SHEARS AND SNIPS, HAND

Armstrong-Blum Mfg. Co., Chicago, Ill.
Bartlett Mfg. Co., Detroit, Mich.
Beverly Throatless Shear Co., Chicago, Ill.
Bremil Mfg. Co., Erie, Pa.
Clauss Shear Co., Fremont, O.
Crescent Tool Co., Jamestown, N. Y.
Excelsior Tool & Machine Co., East St. Louis, Ill.
G. D. S. Machine & Supply Co., Inc., New York, N. Y.
Grobet File Corp. of America, New York, N. Y.
Hendley & Whittemore, Beloit, Wis.
Kidder Mfg. Co., Inc., J. F., Burlington, Vt. (Angle)
Niagara Machine & Tool Wks., Buffalo, N. Y.
O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Rafter Machine Co., Belleville, N. J.
Snap-On Tools Corp., Kenosha, Wis.
Viking Shear Co., Erie, Pa.
Whitney Metal Tool Co., Rockford, Ill.
Wiss & Sons Co., J., Newark, N. J.

## SHEAVES

*See Pulleys and Sheaves, for Belt Drives*

## SHEET METAL BRAKES

*See Brakes, Sheet Metal*

## SHEET METAL DUCTS

*See Ducts and Duct Fittings, Prefabricated*

## SHEET METAL FITTINGS

*See Ducts and Duct Fittings, Prefabricated*

## SHEET METAL PUNCHES

*See Punches, Sheet Metal*

## SHEETS, ALUMINUM

Aluminum Co. of America, Pittsburgh, Pa.
American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
Fairmont Aluminum Co., Fairmont, W. Va.

## SHEETS, ALUMINUM COATED

● American Rolling Mill Co., The, Middletown, O.

## SHEETS AND BOARD, NON-METALLIC, FOR DUCT CONSTRUCTION

Carey Mfg. Co., Philip, Cincinnati, O.
Celotex Corp., The, Chicago, Ill.
● Grant Wilson, Inc., Chicago, Ill.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Keystone Asphalt Products Co., Chicago, Ill.
Masonite Corp., Chicago, Ill.
Ruberoid Co., New York, N. Y.
Salt Mountain Co., Chicago, Ill.
Technical Ply-Woods, Chicago, Ill.
United States Gypsum Co., Chicago, Ill.
● Wilson, Inc., Grant, Chicago, Ill.

## SHEETS, CLAD

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Aluminum Co. of America, Pittsburgh, Pa.
American Nickeloid Co., Peru, Ill.
● American Rolling Mill Co., The, Middletown, O.
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Granite City Steel Co., Granite City, Ill. (Stainless)
Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Lamb & Ritchie Co., Cambridge, Mass.
Lukens Steel Co., Coatsville, Pa.

## SHEETS, COPPER

● American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
New Haven Copper Co., Seymour, Conn.
● Revere Copper and Brass, Incorporated, New York, N. Y.
United States Brass & Copper Co., Hyde Park, Boston, Mass.
● Weirton Steel Co., Weirton, W. Va.
● Western Brass Mill Div., Olin Industries, Inc., East Alton, Ill. (Brass, bronze, phosphor bronze)

## SHEETS, LEAD

Alpha Metals, Inc., Brooklyn, N. Y.
American Smelting & Refining Co., New York, N. Y.
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.

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Continental Steel Corp., Kokomo, Ind. (Coated)
Downs-Smith Brass & Copper Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Illinois Zinc Co., Chicago, Ill.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Wks., Rochester, N. Y.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
● Weirton Steel Co., Weirton, W. Va. (Alloy coated)

## SHEETS, MAGNESIUM ALLOY

● Dow Chemical Co., The, Midland, Mich.
● Revere Copper and Brass, Incorporated, New York, N. Y.

## SHEETS, METAL, WITH PROTECTIVE NON-METALLIC COATING

American Steel Band Co., Pittsburgh, Pa.
Cheney Metal Products Co., Trenton, N. J.
Protected Steel Products Co., Washington, Pa.
Technical Ply-Woods, Chicago, Ill. (Metal and plywood)

## SHEETS, NICKEL AND NICKEL ALLOY

American Nickeloid Co., Peru, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
International Nickel Co., New York, N. Y.
● Revere Copper and Brass Incorporated, New York, N. Y.
● Western Brass Mill Div., Olin Industries, Inc., East Alton, Ill.

## SHEETS, STEEL, COPPER BEARING

● American Rolling Mill Co., The, Middletown, O.
Berger Mfg. Div., Republic Steel Corp., Canton, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Columbia Steel Co. (Sub. United States Steel Corp.), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Follansbee Steel Corp., Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
● Penn Galvanizing Co., Philadelphia, Pa.
Reeves Steel & Mfg. Co., Dover, O.
● Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Canton, O.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
● Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

## SHEETS, STEEL, GALVANIZED

● American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Cleveland, O.
Apollo Steel Co., Apollo, Pa.
Berger Mfg. Div., Republic Steel Corp., Canton, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Columbia Steel Co. (Sub. United States Steel Corp.), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, New York, N. Y.
Empire Sheet & Tin Plate Co., Mansfield, O.
Follansbee Steel Corp., Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Detroit, Mich.
Inland Steel Co., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Lyon, Conklin & Co., Inc., Baltimore, Md.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
Niles Rolling Mill Co., Niles, O.
Parkersburg Iron & Steel Co., Parkersburg, W. Va.
● Penn Galvanizing Co., Philadelphia, Pa.
Reeves Steel & Mfg. Co., Dover, O.
● Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Canton, O.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
● Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Wood Steel Co., Alan, Conshohocken, Pa.
● Youngstown Sheet & Tube Co., Youngstown, O.

## SHEETS, STEEL, GALVANNEALED

● American Rolling Mill Co., The, Middletown, O.
Berger Mfg. Div., Republic Steel Corp., Canton, O.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
● Penn Galvanizing Co., Philadelphia, Pa.
● Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Div. of Continental Steel Corp., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

## SHEETS, STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
● American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Crucible Steel Co. of America, New York, N. Y.
Eastern Stainless Steel Corp., Baltimore, Md.
Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill
Jessop Steel Co., Washington, Pa.
● Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Steel Corp., Pittsburgh, Pa.
Universal-Cyclops Steel Corp., Bridgeville, Pa.

## SHEETS, WROUGHT IRON

● Byers Co., A. M., Pittsburgh, Pa.

## SHEETS, ZINC

American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
American Zinc Products Co., Greencastle, Ind.
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hegeler Zinc Co., Danville, Ill.
Illinois Zinc Co., Chicago, Ill.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Sales Co., New York, N. Y.

## SHUTTERS

*See Louvers and Shutters*

## SIGHT GLASSES

*See Glasses, Sight, for Pipe Lines*

## SLEEVE BEARINGS

*See Bearings, Sleeve*

## SLEEVES, PIPE REPAIR

*See Clamps, Pipe Repair*

## SMOKE ALARMS

*See Alarms, Smoke*

## SMOKE GUNS

*See Guns and Pots, Smoke and Smudge*

## SMUDGE POTS

*See Guns and Pots, Smoke and Smudge*

## SOCKET WRENCHES

*See Wrenches, Socket*

## SOLAR HEAT RESISTING SCREENS

*See Screens, Sun reflecting*

## SOLDER (SILVER), BRAZING ALLOYS, AND FLUXES

● Air Reduction Sales Co., New York, N. Y.
American Smelting & Refining Co., New York, N. Y.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Eutectic Welding Alloys Co., New York, N. Y.
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Handy & Harman, New York, N. Y.
Hardy, Inc., Charles, New York, N. Y.
Industrial Service Laboratories, Milwaukee, Wis.
Johnson Co., Lloyd S., Chicago, Ill.

## SOLDER (TIN-LEAD), AND FLUXES

● Air Reduction Sales Co., New York, N. Y.
Alpha Metals, Inc., Brooklyn, N. Y.
● American Brass Co., Waterbury, Conn.
American Smelting & Refining Co., New York, N. Y.
American Solder & Flux Co., Philadelphia, Pa.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Benson Co., Inc., Alex R., Hudson, N. Y.
Burnley Battery & Mfg. Co., North East, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Gardiner Metal Co., Chicago, Ill.
Glaser Lead Co., Inc., Brooklyn, N. Y.
Hercules Chemical Co., Inc., New York, N. Y.
Industrial Service Laboratories, Milwaukee, Wis.
Johnson Co., Lloyd S., Chicago, Ill.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kester Solder Co., Chicago, Ill.
Klauer Mfg. Co., Dubuque, Ia.
Lewis Laboratories, Inc., Paul, Milwaukee, Wis.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
Merchant & Evans Co., Philadelphia, Pa.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Works, Inc., Rochester, N. Y.
Ruby Chemical Co., Columbus, O.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Utility Laboratory, Inc., Brooklyn, N. Y.
Wolfe-Kote Co., Sheboygan, Wis.

## SOLENOID VALVES

*See Valves, Solenoid*

## SOOT BLOWERS

*See Blowers, Soot*

● Advertisement in this issue. See Index to Advertisers, page 350.

## SOOT DESTROYERS
*See Destroyers, Soot, Chemical*

## SOUND DEADENING FOR CEILING AND WALL
*See Insulation, Ceiling and Wall, Sound Deadening*

## SOUND DEADENING FOR DUCTS
*See Insulation, Duct, Sound Deadening*

## SOUND INDICATORS
*See Indicators, Sound Level*

## SPEED CHANGERS
*See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical*

## SPEED REDUCERS
*See Reducers, Speed*

## SPIRAL PIPE
*See Pipe, Spiral, Riveted and Welded*

## SPOT WELDERS
*See Welders, Spot*

## SPRAY HUMIDIFIERS
*See Humidifiers, Direct, Spray Head*

## SPRAY NOZZLES
*See Nozzles, Spray*

## SPRAY PAINTING BOOTHS
*See Booths, Painting, Spray*

## SPRINKLER HEADS
*See Heads, Sprinkler*

## SPRINKLER SYSTEM CONTROLS
*See Controls, Fire Protection Sprinkler Systems; Valves, Fire Protection Sprinkler System Control*

## STAINLESS STEEL PIPE
*See Pipe, Steel, Stainless*

## STAINLESS STEEL SHEETS
*See Sheets, Steel, Stainless*

## STANDS, PIPE VISE
- American Pipe Tool Co., Chicago, Ill.
- Armstrong Mfg. Co., Bridgeport, Conn.
- Crown Die & Tool Co., Chicago, Ill.
- Hollands Mfg. Co., Erie, Pa.
- Martin & Sons, H. P., Owensboro, Ky.
- Nye Tool & Machine Co., Chicago, Ill.
- ● Ridge Tool Co., Elyria, O.
- Toledo Pipe Threading Machine Co., Toledo, O.
- Western Wire Products Co., St. Louis, Mo.
- Williams & Co., J. H., Buffalo, N. Y.

## STEAM BOOSTER COMPRESSORS
*See Compressors, Steam Booster*

## STEAM ENGINES
*See Engines, Steam*

## STEAM JET REFRIGERATION
*See Compressors, Refrigerating, Steam Jet*

## STEAM PRESSURE REGULATORS
*See Valves, Pressure Reducing and Regulating*

## STEAM PUMPS
*See Pumps, Steam*

## STEAM SEPARATORS
*See Separators, Steam and Oil*

## STEAM TRAPS
*See Traps, Steam*

## STEEL PIPE
*See Pipe, Steel*

## STEEL TUBING
*See Tubing, Steel*

## STEEL UNIONS
*See Unions, Steel*

## STEEL VALVES
*See Valves, Gate; and Valves, Globe*

## STERILIZING LAMPS
*See Lamps, Sterilizing, for Duct Installation*

## STOCKS AND DIES
- American Pipe Tool Co., Chicago, Ill.
- Armstrong Bros. Tool Co., Chicago, Ill.
- Armstrong Mfg. Co., Bridgeport, Conn.
- Beaver Pipe Tools, Inc., Warren, O.
- Champion Blower & Forge Co., Lancaster, Pa.
- Crown Die & Tool Co., Chicago, Ill. (Pipe)
- Erie Tool Wks., Erie, Pa.
- Greenfield Tap & Die Corp., Greenfield, Mass.
- Hollands Mfg. Co., Erie, Pa.
- Nye Tool & Machine Co., Chicago, Ill.
- Oster Mfg. Co., Cleveland, O.
- ● Ridge Tool Co., Elyria, O.
- Toledo Pipe Threading Machine Co., Toledo, O.

## STOKERS, INDUSTRIAL AND COMMERCIAL
*61 to 1200 Lb per Hr*

- American Coal Burner Co., Chicago, Ill.
- ● American Engineering Co., Philadelphia, Pa.
- Anchor Stove & Range Co., New Albany, Ind.
- Auburn Foundry, Inc., Stoker Div., Auburn, Ind.
- Babcock & Wilcox Co., New York, N. Y.
- Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
- Brownell Co., Dayton, O.
- Burke Stoker & Mfg. Co., Chicago, Ill.
- Burnham Stoker Co., Vancouver, Wash.
- Canton Stoker Corp., Canton, O.
- Carnes, Inc., John R., Lima, O.
- Catskill Metal Works, Inc., Catskill, N. Y.
- Central Rubber & Steel Corp., Findlay, O.
- Chesapeake & Ohio R. R. Co., Cleveland, O.
- Clizbe Bros. Mfg. Co., Plymouth, Ind.
- Combustion Engineering Co., Inc., New York, N. Y.
- Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
- Cooper & Cooper, Pittsfield, Mass.
- ● Crown Iron Works, Minneapolis, Minn.
- Detroit Stoker Co., Detroit, Mich.
- Econocol Stoker Div. of Cotta Transmission Corp., Rockford, Ill.
- Eddy Stoker Corp., Chicago, Ill.
- Fairbanks, Morse & Co., Chicago, Ill.
- Firemood Machine Wks., Converse, Ind.
- Flynn & Emrich Co., Baltimore, Md.
- ● Frederick Iron & Steel Co., Frederick, Md.
- Fuel Savers, Inc., Harrisburg, Pa.
- Gehl Bros. Mfg. Co., West Bend, Wis.
- General Machinery Co., Spokane, Wash.
- Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
- Heating Assurance, Inc., Spokane, Wash.
- Her-Born Engrg. & Mfg. Co., Sandusky, O.
- Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.
- ● Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
- ● Illinois Iron & Bolt Co., Chicago, Ill.
- International Engineering Wks., Inc. Framingham, Mass.
- ● Iron Fireman Mfg. Co., Cleveland, O.
- Kingston Products Corp., Kokomo, Ind.
- Kol-Master Corp., Oregon, Ill.
- Laclede Stoker Co., St. Louis, Mo.
- Leffel & Co., Springfield, O.
- ● Link-Belt Co., Chicago, Ill.
- "Loyal Knight" Stokers, Inc., Belleville, Ill.
- Mallory Sales Co., Dolton, Ill.
- Meyer Furnace Co., The, Peoria, Ill.
- Muncie Gear Wks., Inc., Muncie, Ind.
- National Steam Pump Co., Upper Sandusky, O.
- Neemes Foundry, Inc., Troy, N. Y.
- Northern Steel & Stoker Corp., Peoria, Ill.
- Ormsby-Osterman, Inc., St. Louis, Mo.
- OverSpred Stoker Co., Chicago, Ill.
- Peerless Mfg. Corp., Louisville, Ky.
- Perfection Grate & Stoker Co., Springfield, Mass.
- Plymouth Industries, Inc., Plymouth, Ind.
- Pocahontas Fuel Co., Inc., Stoker Div., Cleveland, O.
- Riley Stoker Corp., Worcester, Mass.
- Rosedale Foundry & Machine Co., Pittsburgh, Pa.
- Schwitzer-Cummins Co., Indianapolis, Ind.
- Scott-Newcomb, Inc., St. Louis, Mo.
- Sinker-Davis Co., Indianapolis, Ind.
- Steel Products Engineering Co., Springfield, O.
- Stok-A-Fire Co., University City, Mo.
- Stokermatic Div., Rheem Mfg. Co., Salt Lake City, Utah.
- Sun-Fire Stoker Corp., New Albany, Ind.
- Thermal Engineering Co., Chicago, Ill.
- U. S. Machine Corp., Lebanon, Ind.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Whiting Stoker Co., Chicago, Ill.
- Whitty Co., Inc., Boston, Mass.
- Will-Burt Co., The, Orrville, O.

## STONEWARE PIPE
*See Pipe, Stoneware*

## STORAGE WATER HEATERS
*See Heaters, Water, Steam, Storage*

## STRAINERS, PIPE LINE
- ● Alco Valve Co., St. Louis, Mo.
- Alten's Foundry & Machine Works, Lancaster, O.
- ● American District Steam Co., North Tonawanda, N. Y.
- American Injector Co., Detroit, Mich.
- ● Anderson Co., V. D., The, Cleveland, O.
- Barrett, Haentjens & Co., Hazleton, Pa.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Blackmer Pump Co., Grand Rapids, Mich.
- Bowser, Inc., Fort Wayne, Ind.
- Boylston Steam Specialty Co., Chicago, Ill.
- ● Cash Co., A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Cashin Co., W. D., Boston, Mass.
- Central Brass Mfg. Co., Cleveland, O.
- Cooper Co., Clark, Palmyra, N. J.
- ● Crane Co., Chicago, Ill.
- Cuno Engineering Corp., Meriden, Conn.
- Davis Regulator Co., Chicago, Ill.
- Dri-Steam Products, Inc., New York, N. Y.
- Edward Valve & Mfg. Co., Inc., East Chicago, Ind.

● Advertisement in this issue. See Index to Advertisers, page 350.

Elliott Co., Jeannette, Pa.
● Fisher Governor Co., Marshalltown, Ia.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Foster Engineering Co., Newark, N. J.
Foster Pump Works, Inc., Brooklyn, N. Y.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Kaye & MacDonald, Inc., West Orange, N. J.
Keckley Co., O. C., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Leslie Co., Lyndhurst, N. J.
● Maid-O'-Mist, Inc., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
● Mueller Brass Co., Port Huron, Mich.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Long Island City, N. Y.
Newark Wire Cloth Co., Newark, N. J.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Phillips & Co., H. A., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarco Co., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelpia, Pa.
Scientific Instrument Co., Detroit, Mich.
Sheffler-Gross Co., Philadelphia, Pa.
Spence Engineering Co., Walden, N. Y.
Spray Engineering Co., Somerville, Mass.
● Spraying Systems Co., Chicago, Ill.
Staples & Pfeiffer, San Francisco, Calif.
● Sterling, Inc., Milwaukee, Wis.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Trimount Rotary Power Co., East Dedham, Mass.
Tryco Products, Inc., Westfield, Mass.
Wade Mfg. Co., Elgin, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.
● Yarnall-Waring Co., Philadelphia, Pa.
Zallea Brothers & Johnson, Wilmington, Del.

### STRESS RELIEVERS

*See Preheaters and Stress Relievers, Electric, for Pipe Welds*

### STRIP HEATERS

*See Heaters, Strip and Immersion, Electric*

### STRUCTURAL SHAPES

*See Angles, Bars, Beams, Channels and Tees*

### STUD WELDERS

*See Welders, Stud*

### SUCTION LINE HEAT EXCHANGERS

*See Exchangers, Heat, Refrigerant Suction Line*

### SUMP PUMPS

*See Pumps, Sump*

### SUPERHEATERS, PROCESS STEAM

● Bell & Gossett Co., Morton Grove, Ill.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Combustion Engineering Co., Inc., New York, N. Y.
Edge Moor Iron Works, Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Selas Corp. of America, Philadelphia, Pa.

### SURFACE, FINNED, COOLING, BRINE

● Acme Industries, Inc., Jackson, Mich.
● Areofin Corp., Syracuse, N. Y.
Beacon-Morris Corp., Boston, Mass.
Betz Corp., Hammond, Ind.
Bohn Aluminum & Brass Corp., Detroit, Mich.
● Bush Mfg. Co., Hartford, Conn.
Conditionaire Unit Co., Chicago, Ill.
● Drayer & Hanson, Inc., Los Angeles, Calif.
● G. & O. Mfg. Co., New Haven, Conn.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Griscom-Russell Co., The, New York, N. Y.
Industrial Mfg. & Engineering Co., Chicago, Ill.
● Kramer Trenton Co., Trenton, N. J.
● Marlo Coil Co., St. Louis, Mo.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Roessing Mfg. Co., Pittsburgh, Pa.
Rome-Turney Radiator Co., Rome, N. Y.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Super Radiator Corp., Minneapolis, Minn.
● Trane Co., The, La Crosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
X L Refrigerating Co., Chicago, Ill.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

### SURFACE, FINNED, COOLING, COLD WATER

● Acme Industries, Inc., Jackson, Mich.
● Aerofin Corp., Syracuse, N. Y.
● Airtemp, Div. of Chrysler Corp., Dayton, O.
● Airtherm Mfg. Co., St. Louis, Mo.
Beacon-Morris Corp., Boston, Mass.
Betz Corp., Hammond, Ind.
Bohn Aluminum & Brass Corp., Detroit, Mich.
● Bush Mfg. Co., Hartford, Conn.
Campbell Heating Co., E. K., Kansas City, Mo.
Conditionaire Unit Co., Chicago, Ill.
● Drayer & Hanson, Inc., Los Angeles, Calif.
● Extended Surface, Inc., Brooklyn, N. Y.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
Frigidaire Div., General Motors Corp., Dayton, O.
● G. & O. Mfg. Co., New Haven, Conn.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Griscom-Russell Co., The, New York, N. Y.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Johnson Fan & Blower Corp., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
Manufacturers Fin Coil Co., Chicago, Ill.
● Marlo Coil Co., St. Louis, Mo.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
● Modine Mfg. Co., Racine, Wis.
● Murray Mfg. Co., D. J., Wausau, Wis.
● Nesbitt, Inc., John J., Philadelphia, Pa.
Niagara Blower Co., New York, N. Y.
● Palmer Mfg. Corp., Phoenix, Ariz.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Roessing Mfg. Co., Pittsburgh, Pa.
Rome-Turney Radiator Co., Rome, N. Y.
Standard Galvanizing Co., Chicago, Ill.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Super Radiator Corp., Minneapolis, Minn.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
● Wing Mfg. Co., L. J., New York, N. Y.
X L Refrigerating Co., Chicago, Ill.
Yates-American Machine Co., Beloit, Wis.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

### SURFACE, FINNED, COOLING, DIRECT EXPANSION

● Acme Industries, Inc., Jackson, Mich.
● Aerofin Corp., Syracuse, N. Y.
● Airtemp, Div. of Chrysler Corp., Dayton, O.
● Airtherm Mfg. Co., St. Louis, Mo.
Beacon-Morris Corp., Boston, Mass.
Betz Corp., Hammond, Ind.
Bohn Aluminum & Brass Corp., Detroit, Mich.
● Bush Mfg. Co., Hartford, Conn.
Conditionaire Unit Co., Chicago, Ill.
● Drayer & Hanson, Inc., Los Angeles, Calif.
● Extended Surface, Inc., Brooklyn, N. Y.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
Frigidaire Div., General Motors Corp., Dayton, O.
● G. & O. Mfg. Co., New Haven, Conn.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Griscom-Russell Co., The, New York, N. Y.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
Manufacturers Fin Coil Co., Chicago, Ill.
● Marlo Coil Co., St. Louis, Mo.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Standard Galvanizing Co., Chicago, Ill.
- ● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
- X L Refrigerating Co., Chicago, Ill.
- Yates-American Machine Co., Beloit, Wis.
- ● York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

## SURFACE, FINNED, HEATING, INDIRECT, FERROUS

- ● Airtherm Mfg. Co., St. Louis, Mo.
- Bayley Blower Co., Milwaukee, Wis.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Conditionaire Unit Co., Chicago, Ill.
- ● Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Modine Mfg. Co., Racine, Wis.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- New York Blower Co., Chicago, Ill.
- Niagara Blower Co., New York, N. Y.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- ● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- ● Trane Co., The, La Crosse, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- Wolff & Munier, Inc., New York, N. Y. (For panel heating)

## SURFACE, FINNED, HEATING, INDIRECT, NON-FERROUS

- ● Aerofin Corp., Syracuse, N. Y.
- ● Airtherm Mfg. Co., St. Louis, Mo.
- Bayley Blower Co., Milwaukee, Wis.
- Beacon-Morris Corp., Boston, Mass.
- Bohn Aluminum & Brass Corp., Detroit, Mich.
- ● Bush Mfg. Co., Hartford, Conn.
- Campbell Heating Co., E. K., Kansas City, Mo.
- ● Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Extended Surface, Inc., Brooklyn, N. Y.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- Johnson Fan & Blower Corp., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Kennard Corp., St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- Larkin Coils, Inc., Atlanta, Ga.
- Manufacturers Fin Coil Co., Chicago, Ill.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Corp., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- ● Modine Mfg. Co., Racine, Wis.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- ● Nesbitt, Inc., John J., Philadelphia, Pa.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Marion, Ind.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Rome-Turney Radiator Co., Rome, N. Y.
- ● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- ● Trane Co., The, La Crosse, Wis.
- ● Wing Mfg. Co., L. J., New York, N. Y.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
- ● York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

## SURFACE THERMOSTATS

***See Thermostats, Surface***

## SWING JOINTS

***See Joints, Pipe, Flexible Swing and Revolving***

## SWITCHES, ELECTRICAL

- Acro Electric Co., Cleveland, O.
- Adam Electric Co., Frank, St. Louis, Mo.
- Allen-Bradley Co., Milwaukee, Wis.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
- Automatic Switch Co., New York, N. Y.
- ● Barber-Colman Co., Rockford, Ill.
- Clark Controller Co., Cleveland, O.
- Consolidated Car-Heating Co., Inc., Albany, N. Y.
- Cooper Co., Clark, Palmyra, N. J.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Delta-Star Electric Co., Chicago, Ill.
- Dunn, Inc., Struthers, Philadelphia, Pa.
- Electric Controller & Mfg. Co., Cleveland, O.
- Electric Machinery Mfg. Co., Minneapolis, Minn.
- ● General Controls Co., Glendale, Calif.
- General Electric Co., Schenectady, N. Y.
- Guardian Electric Mfg. Co., Chicago, Ill.
- Hart Mfg. Co., Hartford, Conn.
- Marsh Corp., Jas. P., Chicago, Ill.
- ● Martens & Stormoen, Boston, Mass.
- ● McDonnell & Miller, Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.
- Micro Switch Corp., Freeport, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Monitor Controller Co., The, Baltimore, Md.
- ● Penn Electric Switch Co., Goshen, Ind.
- Perfex Corp., Milwaukee, Wis.
- Square D Co., Detroit, Mich.
- Square D Co., Industrial Controller Div., Milwaukee, Wis.
- Struthers Dunn, Inc., Philadelphia, Pa.
- Tork Clock Co., Inc., Mount Vernon, N. Y.
- Trumbull Electric Mfg. Co., Plainville, Conn.
- ● Ward Leonard Electric Co., Mount Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- White Mfg. Co., St. Paul, Minn.
- Zenith Electric Co., Chicago, Ill.

## SWITCHES, FLOAT, REFRIGERATION

- ● Alco Valve Co., St. Louis, Mo.
- Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
- Clark Controller Co., Cleveland, O.
- Frick Co., Waynesboro, Pa.
- ● McDonnell & Miller, Chicago, Ill.
- ● Mercoid Corp., The, Chicago, Ill.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- ● Ward Leonard Electric Co., Mount Vernon, N. Y.

## SWITCHES, FLOW

- Cooper Co., Clark, Palmyra, N. J.
- Drying Systems, Inc., Chicago, Ill.
- ● General Controls Co., Glendale, Calif.
- ● McDonnell & Miller, Chicago, Ill.
- Morey & Jones, Ltd., Los Angeles, Calif.

## SWITCHES, LIQUID LEVEL

- ● Alco Valve Co., St. Louis, Mo.
- Allen-Bradley Co., Milwaukee, Wis.
- Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
- Automatic Control Co., St. Paul, Minn.
- B/W Controller Corp., Birmingham, Mich.
- Bennett Oil Co., Omaha, Neb.
- Cissell Mfg. Co., W. M., Louisville, Ky.
- Cooper Co., Clark, Palmyra, N. J.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● General Controls Co., Glendale, Calif.
- General Electric Co., Schenectady, N. Y.
- Healy Ruff Co., St. Paul, Minn.
- Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
- Kisco Boiler & Engineering Co., St. Louis, Mo.
- ● McAlear Mfg. Co., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Monitor Controller Co., The, Baltimore, Md.
- ● Penn Electric Switch Co., Goshen, Ind.
- Photoswitch, Inc., Cambridge, Mass.
- Ruggles-Klingemann Mfg. Co., Salem, Mass.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Square D Co., Detroit, Mich.
- Square D Co., Industrial Controller Div., Milwaukee, Wis.
- ● Stephens-Adamson Mfg. Co., Aurora, Ill.
- Trumbull Electric Mfg. Co., Plainville, Conn.
- ● Ward Leonard Electric Co., Mount Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## SWITCHES, MERCURY

- Automatic Temperature Control Co., Inc., Philadelphia, Pa.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- Durakool, Inc., Elkhart, Ind.
- General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
- Hart Mfg. Co., Hartford, Conn.
- Jefferson Electric Co., Bellwood, Ill.
- ● Mercoid Corp., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

## SWITCHES, PRESSURE AND VACUUM

- Allen-Bradley Co., Milwaukee, Wis.
- ● Au-Temp-Co Corp., New York, N. Y.
- ● Barber-Colman Co., Rockford, Ill.
- Clark Controller Co., Cleveland, O.
- Cook Electric Co., Chicago, Ill.
- Cooper Co., Clark, Palmyra, N. J.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- ● Detroit Lubricator Co., Detroit, Mich.
- General Electric Co., Schenectady, N. Y.
- Gleason-Avery, Inc., Auburn, N. Y.
- Healy Ruff Co., St. Paul, Minn.
- Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
- Marsh Corp., Jas. P., Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 350.

- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Monitor Controller Co., The, Baltimore, Md.
- ● Penn Electric Switch Co., Goshen, Ind.
- Perfex Corp., Milwaukee, Wis.
- Pioneer Heat Regulator Div., Master Electric Co., The. Dayton, O.
- Sampsel Time Control, Inc., Spring Valley, Ill.
- Spencer Thermostat Co., Attleboro, Mass.
- Square D Co., Detroit, Mich.
- Square D Co., Industrial Controller Div., Milwaukee, Wis.
- Uniflow Mfg. Co., Erie, Pa.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- ● Ward Leonard Electric Co., Mount Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- ● White-Rodgers Electric Co., St. Louis, Mo.

## SWITCHES, TIME

- Allen-Bradley Co., Milwaukee, Wis.
- ● Au-Temp-Co Corp., New York, N. Y.
- Automatic Temperature Control Co., Inc., Philadelphia, Pa.
- ● Barber-Colman Co., Rockford, Ill.
- Cooper Co., Clark, Palmyra, N. J.
- Cramer Co., Inc., R. W., The, Centerbrook, Conn.
- ● Detroit Lubricator Co., Detroit, Mich.
- Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
- General Electric Co., Schenectady, N. Y.
- Gleason-Avery, Inc., Auburn, N. Y.
- Healy Ruff Co., St. Paul, Minn.
- Industrial Engineering Corp., Terre Haute, Ind.
- International Register Co., Chicago, Ill.
- Landis & Gyr, Inc., New York, N. Y.
- ● Mercoid Corp., Chicago, Ill.
- Miller Heat-O-Meter Co., Milwaukee, Wis.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- National Time & Signal Corp., Detroit, Mich.
- Paragon Electric Co., Chicago, Ill.
- ● Penn Electric Switch Co., Goshen, Ind.
- Perfex Corp., Milwaukee, Wis.
- Photoswitch, Inc., Cambridge, Mass.
- Reliance Automatic Lighting Co., Racine, Wis.
- Reynolds Electric Co., Chicago, Ill.
- Rhodes, Inc., M. H., Hartford, Conn.
- Sampsel Time Control, Inc., Spring Valley, Ill.
- Sangamo Electric Co., Springfield, Ill.
- Tork Clock Co., Inc., Mount Vernon, N. Y.
- ● Ward Leonard Electric Co., Mount Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- ● White-Rodgers Electric Co., St. Louis, Mo.
- Zenith Electric Co., Chicago, Ill.

## SYSTEMS, COMBUSTION CONTROL

- Askania Regulator Co., Chicago, Ill.
- Bailey Meter Co., Cleveland, O.
- Bowser, Inc., Fort Wayne, Ind.
- Bristol Co., Waterbury, Conn.
- Brooke Engineering Co., Inc., Philadelphia, Pa.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- ● Cash Co., A. W., Decatur, Ill.
- ● Detroit Lubricator Co., Detroit, Mich.
- Drying Systems, Inc., Chicago, Ill.
- Engineer Co., New York, N. Y.
- Ess Instrument Co., Fort Lee, N. J.
- Hagan Corp., Pittsburgh, Pa.
- ● Hays Corp., Michigan City, Ind.
- Hotstream Heater Co., Cleveland, O.
- ● Illinois Engineering Co., Chicago, Ill.
- ● Leeds & Northrup Co., Philadelphia, Pa.
- Mason-Neilan Regulator Co., Boston, Mass.
- ● Mercoid Corp., Chicago, Ill.
- National Brass Co., Grand Rapids, Mich.
- Republic Flow Meters Co., Chicago, Ill.
- Ruggles-Klingemann Mfg. Co., Salem, Mass.
- Selas Corp. of America, Philadelphia, Pa.
- Shallcross Controls, Inc., Milwaukee, Wis.
- Wheelco Instruments Co., Chicago, Ill.
- ● Wing Mfg. Co., L. J., New York, N. Y.

## SYSTEMS, HEATING, HOT WATER

- ● Barber-Colman Co., Rockford, Ill.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- ● General Fittings Co., Providence, R. I.
- Gerstein & Cooper Co., South Boston, Mass.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- Kainer & Co., Chicago, Ill.
- Kehm Corp., The, Chicago, Ill.
- Lawler Automatic Controls, Mount Vernon, N. Y.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- Penberthy Injector Co., Detroit, Mich.
- Preferred Utilities Mfg. Corp., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- ● Sullivan Valve & Engineering Co., Butte, Mont.
- Taco Heaters, Inc., New York, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Trane Co., The, La Crosse, Wis.
- Triplex Heating Specialty Co., Peru, Ind.

## SYSTEMS, HEATING, VACUUM

- All-Vac Steam Control System, Chicago, Ill.
- Anderson Products, Inc., Cambridge, Mass.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- Cashin, W. D., Boston, Mass.
- ● Dunham Co., C. A., Chicago, Ill.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- ● Illinois Engineering Co., Chicago, Ill.
- Lonn Mfg. Co., Inc., Chicago, Ill.
- Marsh Corp., Jas. P., Chicago, Ill.
- Monash-Younker Co., Chicago, Ill.
- Mouat Vapor Heating Co., The, Cleveland, O.
- ● Sarco Co., Inc., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- ● Sterling, Inc., Milwaukee, Wis.
- Stickle Steam Specialties Co., Indianapolis, Ind.
- ● Trane Co., The, La Crosse, Wis.
- ● Webster & Co., Warren, Camden, N. J.

## SYSTEMS, HEATING, VAPOR

- All-Vac Steam Control System, Chicago, Ill.
- ● American District Steam Co., North Tonawanda, N. Y.
- ● Au-Temp-Co Corp., New York, N. Y.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- Cashin Co., W. D., Boston, Mass.
- ● Dunham Co., C. A., Chicago, Ill.
- Gorton Heating Corp., Cranford, N. J.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- ● Illinois Engineering Co., Chicago, Ill.
- Monash-Younker Co., Chicago, Ill.
- Mouat Vapor Heating Co., The, Cleveland, O.
- ● Sarco Co., Inc., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- ● Sterling, Inc., Milwaukee, Wis.
- ● Trane Co., The, La Crosse, Wis.
- Vapor Specialty Co., New York, N. Y.
- ● Webster & Co., Warren, Camden, N. J.

## SYSTEMS, HEATING, ZONE CONTROL

- Armstrong Heat Control Co., Portland, Ore.
- ● Au-Temp-Co Corp., New York, N. Y.
- Automatic Temperature Control Co., Inc. Philadelphia, Pa
- ● Barber-Colman Co., Rockford, Ill.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- ● Bell & Gossett Co., Morton Grove, Ill.
- ● Dunham Co., C. A., Chicago, Ill.
- ● Illinois Engineering Co., Chicago, Ill.
- ● Johnson Service Co., Milwaukee, Wis.
- Major Controls Sales Div., Cambridge, Mass.
- Marsh Tritrol Co., Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- ● Sarco Co., Inc., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- Simplex Heating Specialty Co., Inc., Lynchburg, Va.
- Spence Engineering Co., Inc., Walden, N. Y.
- Tallmadge & Co., Webster, East Orange, N. J.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Webster & Co., Warren, Camden, N. J.
- Webster Tallmadge & Co., East Orange, N. J.

## SYSTEMS, PROCESS HEATING, HIGH TEMPERATURE

- Air Devices, Inc., New York, N. Y.
- All-Vac Steam Control System, Chicago, Ill.
- Automatic Temperature Control Co., Inc., Philadelphia, Pa
- ● Dow Chemical Co., The, Midland, Mich.
- ● Dravo Corp., Pittsburgh, Pa.
- Foster Wheeler Corp., New York, N. Y.
- ● Illinois Engineering Co., Chicago, Ill.
- Lee Engineering Co., Youngstown, O.
- Parks-Cramer Co., Fitchburg, Mass.
- Ross Engineering Corp., J. O., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- Selas Corp. of America, Philadelphia, Pa.
- ● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
- Trent Co., Harold E., Philadelphia, Pa.
- Williams, Inc., F. C., Dearborn, Mich.
- ● Wing Mfg. Co., L. J., New York, N. Y.

## SYSTEMS, ROOF SPRAYING (FOR COOLING ROOFS

- April Showers Co., Washington, D. C.
- Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
- Rockwood Sprinkler Co., Worcester, Mass.
- Ross Sprinkler Co., Pasadena, Calif.
- Ruppright, Siegfried, Los Angeles, Calif.
- Spray Engineering Co., Somerville, Mass.
- ● Spraying Systems Co., Chicago, Ill.
- Thermal Industries, Indio, Calif.
- ● Trane Co., The, LaCrosse, Wis.
- Water Cooling Corp., New York, N. Y.

## SYSTEMS, SPRINKLER, FOR AIR CONDITIONING DUCT SYSTEMS

- Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
- Rockwood Sprinkler Co., Worcester, Mass.
- Water Cooling Corp., New York, N. Y.

## TANK HEADS

*See Parts, for Heating and Air Conditioning Equipment*

## TANKS, EXPANSION, FOR HOT WATER HEATING SYSTEMS

- ● Bell & Gossett Co., Morton Grove, Ill.
- Biggs Boiler Works Co., E. Akron, O.
- Buffalo Tank Corp., Dunellen, N. J.

● Advertisement in this issue. See Index to Advertisers, page 350.

Caldwell Co., W. E., Louisville, Ky.
Case & Son Mfg. Co., W. A., Buffalo, N. Y.
Kehm Corp., The, Chicago, Ill.
Koven & Bro., Inc., L. O., Jersey City, N. J.
Maysteel Products, Inc., Mayville, Wis.
Stainless & Steel Products Co., St. Paul, Minn.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Western Blower Co., Seattle, Wash.

## TANKS, PROCESS AND STORAGE

Aluminum Co. of America, Pittsburgh, Pa.
American Hard Rubber Co., New York, N. Y.
American Locomotive Co., Alco Products Div., New York, N. Y.
Ames Iron Works, Div. of Pierce Butler Radiator Corp, Oswego, N. Y.
Babcock & Wilcox Co., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Bigelow Co., New Haven, Conn.
Biggs Boiler Wks. Co., E. Akron, O.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
Buffalo Tank Corp., Dunellen, N. J.
Caldwell Co., W. E., Louisville, Ky.
Case & Son Mfg. Co., W. A., Buffalo, N. Y.
Chicago Bridge & Iron Co., Chicago, Ill.
Chicago Steel Tank Co., Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
Connery Construction Co., Philadelphia, Pa.
Continental Diamond Fibre Co., Newark, Del.
Dahlquist Mfg. Co., Inc., Somerville, Mass.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Day Co., The, Minneapolis, Minn.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Dillon Steam Boiler Wks., Inc., D. M., Fitchburg, Mass.
Downingtown Iron Works, Downingtown, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Falstrom Co., Passaic, N. J.
Farquhar Co., Ltd., A. B., York, Pa.
Farrar & Trefts, Buffalo, N. Y.
Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
Frank Heaters, Inc., Paterson, N. J.
Frick Co., Waynesboro, Pa.
Gehri Co., Tacoma, Wash.
Gerstein & Cooper Co., South Boston, Mass.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Goodrich Co., B. F., Akron, O. (Rubber lined)
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Hamburg Boiler Wks., Inc., Hamburg, Pa.
Harris & Co., Arthur, Chicago, Ill.
Illinois Oil Co., Rock Island, Ill.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Framingham, Mass.
● Kewanee Boiler Corp., Kewanee, Ill.
Kirk & Blum Mfg. Co., Cincinnati, O.
Knight, Maurice A., Akron, O.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
La Crosse Tractor Co., La Crosse, Wis.
Lead Lined Iron Pipe Co., Wakefield, Mass.
Littleford Bros., Cincinnati, O.
Lumm Co., A. H., Toledo, O.
Manitowoc Boiler Wks., Manitowoc, Wis.
Mauck Seamless Copper Tank Co., Victor, Norristown, Pa.
Maysteel Products, Inc., Mayville, Wis.
Murray Iron Wks. Co., Burlington, Ia.
National Lead Co., New York, N. Y.
National Radiator Co., The, Johnstown, Pa.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Quaker City Iron Wks., Philadelphia, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Roessing Mfg. Co., Pittsburgh, Pa.
Rosebraugh Co., W. W., Salem, Ore.
Scaife Co., Oakmont, Pa.
Sims Co., Erie, Pa.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Stainless & Steel Products Co., St. Paul, Minn.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
Strandwitz & Co., Inc., W. J., Camden, N. J.
Struthers Wells Corp., Titusville, Pa.
Tippett & Wood, Phillipsburg, N. J.
Trageser Copper Wks., Inc., Maspeth, Long Island, N. Y.
Uniflow Mfg. Co., Erie, Pa.
United States Rubber Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.
Vesco Corp., New York, N. Y.
Walsh-Holyoke Steam Boiler Co., Holyoke, Mass.
Waterfilm Boilers, Inc., Jersey City, N. J.
Western Blower Co., Seattle, Wash.
Wheeling Steel Corp., Wheeling, W. Va. (Heater)
● Whitlock Mfg. Co., Hartford, Conn.
Zallea Brothers & Johnson, Wilmington, Del.

## TANKS, WASH, FOR CASTINGS

● Bell & Gossett Co., Morton Grove, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.

## TEMPERATURE AND HUMIDITY CONTROLS

*See Humidistats; Recorder-Controllers; Thermostats*

## TEMPERATURE RECORDERS

*See Recorders, Temperature*

## TEMPERATURE REGULATORS

*See Regulators, Temperature*

## TEST CHAMBERS

*See Chambers, Test, Controlled Temperature and Humidity*

## TESTERS, GAGE, DEAD WEIGHT

Ashton Valve Co., Cambridge, Mass.

## THERMOMETERS, INDICATING, INDUSTRIAL

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
American Thermometer Co., St. Louis, Mo.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
● Martocello & Co., Jos. A., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Mfg. Corp., New York, N. Y.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
United States Gauge Co., Sellersville, Pa.
Weston Electrical Instrument Corp., Newark, N. J.
Wheelco Instruments Co., Chicago, Ill.

## THERMOMETERS, INDICATING, REMOTE-READING

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Fee & Stemwedel, Inc., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
Hotstream Heater Co., Cleveland, O.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
● Powers Regulator Co., Chicago, Ill.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
● Sarco Co., Inc., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
United States Gauge Co., Sellersville, Pa.
Weksler Thermometer Corp., New York, N. Y.
Wheelco Instruments Co., Chicago, Ill.

## THERMOMETERS, INDICATING, WALL

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
American Thermometer Co., St. Louis, Mo.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Eimer & Amend, New York, N. Y.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Fee & Stemwedel, Inc., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Leeds & Northrup Co., Philadelphia, Pa.
● Martocello & Co., Jos. A., Philadelphia, Pa.

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Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
United States Gauge Co., Sellersville, Pa.
Weksler Thermometer Corp., New York, N. Y. (Effective temperature indicator)
Wheelco Instruments Co., Chicago, Ill.

## THERMOMETERS, KATA

Eimer & Amend, New York, N. Y.
G. M. Mfg. Co., New York, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Precision Thermometer & Instrument Co., Philadelpia, Pa.

## THERMOSTATIC BELLOWS

*See Bellows, Thermostatic*

## THERMOSTATIC BI-METALS

*See Bi-Metals, Thermostatic*

## THERMOSTATIC TRAPS

*See Traps, Steam, Thermostatic*

## THERMOSTATS, DUCT TYPE

Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Burling Instrument Co., Newark, N. J.
● Detroit Lubricator Co., Detroit, Mich.
Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Johnson Service Co., Milwaukee, Wis.
Leslie Co., Lyndhurst, N. J.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
● Sarco Co., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Standard Thermometer, Inc., Boston, Mass.
Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
● Taylor Instrument Companies, Rochester, N. Y.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
● White-Rodgers Electric Co., St. Louis, Mo.

## THERMOSTATS, EFFECTIVE TEMPERATURE

● Barber-Colman Co., Rockford, Ill.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.

## THERMOSTATS, IMMERSION

American Instrument Co., Silver Spring, Md.
Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Burling Instrument Co., Newark, N. J.
● Detroit Lubricator Co., Detroit, Mich.
Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
● Fenwal, Inc., Ashland, Mass.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Red Spot Electric Co., Tacoma, Wash.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Struthers Dunn, Inc., Philadelphia, Pa.
Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Warren Electric Appliance Co., Warren, Pa.
Westinghouse Electric & Mfg. Co., Mansfield, O.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.
Wilcolator Co., Elizabeth, N. J.

## THERMOSTATS, RADIANT HEAT

Sarcotherm Controls, Inc., Chicago, Ill.

## THERMOSTATS, ROOM OR WALL

Armstrong Heat Control Co., Portland, Ore.
● Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Crise Elec. Mfg. Co., Columbus, O.
● Detroit Lubricator Co., Detroit, Mich.
Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
Gleason-Avery, Inc., Auburn, N. Y.
● Illinois Engineering Co., Chicago, Ill.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
Marsh Tritrol Co., Chicago, Ill.
Master Electric Co., Dayton, O.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., The, Chicago, Ill.
Miller Heat-O-Meter Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Sampsel Time Control, Inc., Spring Valley, Ill.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Standard Thermometer, Inc., Boston, Mass.
Superstat Co., Springfield, Mass.
Tallmadge & Co., Webster, East Orange, N. J
● Thrush & Co., H. A., Peru, Ind.
Tork Clock Co., Inc., Mt. Vernon, N. Y.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

## THERMOSTATS, SURFACE

Armstrong Heat Control Co., Portland, Ore.
● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
● Fenwal, Inc., Ashland, Mass.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Struthers Dunn, Inc., Philadelphia, Pa.
Superstat Co., Springfield, Mass.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

## THERMOSTATS, TWO TEMPERATURE OR DUAL

Armstrong Heat Control Co., Portland, Ore.
● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Burling Instrument Co., Newark, N. J.
● Detroit Lubricator Co., Detroit, Mich.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
Gleason-Avery, Inc., Auburn, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
● Mercoid Corp., The, Chicago, Ill.
Miller Heat-O-Meter Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.

● Advertisement in this issue. See Index to Advertisers, page 350.

● Powers Regulator Co., Chicago, Ill.
Ranco, Inc., Columbus, O.
● Sarco Co., Inc., New York, N. Y.
Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
● White-Rodgers Electric Co., St. Louis, Mo.

## THERMOSTATS, WEATHER COMPENSATING

● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Lawler Automatic Controls, Mount Vernon, N. Y.
Major Controls Sales Div., Cambridge, Mass.
Marsh Tritrol Co., Chicago, Ill.
Miller Heat-O-Meter Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
● Thrush & Co., H. A., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Webster Tallmadge & Co., East Orange, N. J.

## TIME SWITCHES

*See Switches, Time*

## TOGGLE BOLTS

*See Bolts, Toggle and Anchor*

## TONGS, PIPE

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Jarecki Mfg. Co., Erie, Pa.
Trimont Mfg. Co., Boston, Mass.
Williams & Co., J. H., Buffalo, N. Y.

## TOOLS (CHISELS, PLIERS, SCREW DRIVERS, ETC.)

Acme Steel Co., Chicago, Ill. (Strapping tools for holding insulation in place on ducts, pipes, tanks, etc.)
Bernz Co., Inc., Otto, Rochester, N. Y.
Billings & Spencer Co., Hartford, Conn.
● Bonney Forge & Tool Works, Allentown, Pa.
Crescent Tool Co., Jamestown, N. Y.
Everhot Products Co., Chicago, Ill.
Greene, Tweed & Co., New York, N. Y.
Greenlee Tool Co., Div. of Greenlee Bros. & Co., Rockford, Ill.
International Nutyp Tool Co., Oswego, N. Y.
Jessop Steel Co., Washington, Pa.
Millers Falls Co., Greenfield, Mass.
Parker-Kalon Corp., New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Rawlplug Co., Inc., The, New York, N. Y. (drills for masonry)
Snap-On Tools Corp., Kenosha, Wis.
Stanley Electric Tools, Div. of The Stanley Works, New Britain, Conn.
Williams & Co., J. H., Buffalo, N. Y.

## TOOLS, FLARING, FOR TUBING

Everhot Products Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Leonard Precision Products Co., Garden Grove, Calif.
Parker Appliance Co., The, Cleveland, O.
Sac Tool Mfg. Co., St. Louis, Mo.

## TORCHES, BRAZING AND SOLDERING

Aeroil Burner Co., Inc., West New York, N. J.
● Air Reduction Sales Co., New York, N. Y.
Atkins & Co., E. C., Indianapolis, Ind.
Bernz Co., Inc., Otto, Rochester, N. Y.
Clayton & Lambert Mfg. Co., Dearborn, Mich.
Dockson Corp., Detroit, Mich.
Eclipse Fuel Engineering Co., Rockford, Ill.
Ergolyte Mfg. Co., Philadelphia, Pa.
Harris Calorific Co., The, Cleveland, O.
Ideal Commutator Dresser Co., Sycamore, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Insto-Gas Corp., Detroit, Mich.
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Lonn Mfg. Co., Inc., Chicago, Ill.
Marquette Mfg. Co., Minneapolis, Minn.
Milburn Co., Alexander, Baltimore, Md.
Minn-Kota Foundry & Mfg. Co., Fargo, N. D.
Modern Engineering Co., St. Louis, Mo.
National Cylinder Gas Co., Chicago, Ill.
National Safety Device Co., Chicago, Ill.
Reiner & Campbell Co., Inc., Elizabeth, N. J.
Sac Tool Mfg. Co., St. Louis, Mo.
Sight Feed Generator Co., Richmond, Ind.
Smith Welding Equipment Corp., Minneapolis, Minn.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Torit Mfg. Co., St. Paul, Minn.
Trindl Products, Ltd., Chicago, Ill.
Turner Brass Works, The, Sycamore, Ill.
Victor Equipment Co., San Francisco, Calif.
Wall Chemicals Div. of The Liquid Carbonic Corp., Chicago, Ill.
Welding Apparatus Co., Chicago, Ill.

## TORQUE INDICATING WRENCHES

*See Wrenches, Torque Indicating*

## TOWERS, COOLING, ATMOSPHERIC

American Cooling Tower Co., Kansas City, Mo.
Binks Mfg. Co., Chicago, Ill.
Burhorn Co., Edwin, New York, N. Y.
Fluor Corp., Ltd., The, Los Angeles, Calif.
Foster Wheeler Corp., New York, N. Y.
Harry Cooling Towers, Inc., New York, N. Y.
● Lilie-Hoffman Cooling Towers, Inc., St. Louis, Mo.
● Marley Co., Inc., The, Kansas City, Kans.
National Engineering & Mfg. Co., Kansas City, Mo.
● New England Cooling Tower Co., Boston, Mass.
Pennsylvania Engineering Wks., New Castle, Pa.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Pritchard & Co., J. F., Kansas City, Mo.
Research Corp., New York, N. Y.
● Spraying Systems Co., Chicago, Ill.
Stewart Ice Machine Co., Los Angeles, Calif.
Thermal Industries, Indio, Calif.
Tippett & Wood, Phillipsburg, N. J.
Water Cooling Corp., New York, N. Y.
Water Cooling Equipment Corp., St. Louis, Mo.
Water Cooling Tower Co., Chicago, Ill.
● Young Radiator Co., Racine, Wis. (radiator type)

## TOWERS, COOLING, MECHANICAL DRAFT

American Cooling Tower Co., Kansas City, Mo.
Binks Mfg. Co., Chicago, Ill.
Burhorn Co., Edwin, New York, N. Y.
Fluor Corp., Ltd., The, Los Angeles, Calif.
Foster Wheeler Corp., New York, N. Y.
Harry Cooling Towers, Inc., New York, N. Y.
● Lilie-Hoffmann Cooling Towers, Inc., St. Louis, Mo.
● Marley Co., Inc., The, Kansas City, Kans.
● Murray Mfg. Co., D. J., Wausau, Wis.
National Engineering & Mfg. Co., Kansas City, Mo.
● New England Cooling Tower Co., Boston, Mass.
Pennsylvania Engineering Wks., New Castle, Pa.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Pritchard & Co., J. F., Kansas City, Mo.
Research Corp., New York, N. Y.
Thermal Industries, Indio, Calif.
● Trane Co., The, LaCrosse, Wis.
Water Cooling Corp., New York, N. Y.
Water Cooling Equipment Corp., St. Louis, Mo.
Water Cooling Tower Co., Chicago, Ill.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.

## TRANSFORMERS, ELECTRIC

Bogue Electric Co., Paterson, N. J.
Davis & Co., Inc., Dean W., Kentland, Ind.
Eimer & Amend, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Jefferson Electric Co., Bellwood, Ill.
Sola Electric Co., Chicago, Ill.
● Wagner Electric Corp., St. Louis, Mo.
Webster Electric Co., Racine, Wis.

## TRANSMISSION DRIVES

*See Drives, Chain, Flat Belt and V-Belt*

## TRAPS, STEAM, MECHANICAL

● American District Steam Co., North Tonawanda, N. Y.
● Anderson Co., V. D., The, Cleveland, O.
● Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
Bishop & Babcock Mfg. Co., Cleveland, O.
Boylston Steam Specialty Co., Chicago, Ill.
Bundy Steam Trap Co., Nashua, N. H.
Burrows Mfg. Co., F. A., York, Pa.
Cashin Co., W. D., Boston, Mass.
Cochrane Corp., Philadelphia, Pa.
Coe Mfg. Co., Painesville, O.
● Connor Engineering Corp., W. B., New York, N. Y.
● Crane Co., Chicago, Ill.
Cryer Trap & Valve Co., Inc., New York, N. Y.
Davis Engineering Corp., Elizabeth, N. J.
Davis Regulator Co., Chicago, Ill.
● Dunham Co., C. A., Chicago, Ill.
Ellis Drier Co., Chicago, Ill.
● Fisher Governor Co., Marshalltown, Ia.
● Haines & Co., William S., Philadelphia, Pa.
Hanlon-Waters, Tulsa, Okla.
Healy Ruff Co., St. Paul, Minn.
● Hoffman Specialty Co., Indianapolis, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
Justus Steam Trap Co., Napanoch, N. Y.
Kaye & MacDonald, Inc., West Orange, N. J.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Marsh Corp., Jas. P., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
McAuley Trap Co., Pittsburgh, Pa.
Milwaukee Valve Co., Milwaukee, Wis.

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Monash-Younker Co., Chicago, Ill.
Morehead Mfg. Co., Detroit, Mich.
Mouat Vapor Heating Co., The, Cleveland, O.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Nason Co., Detroit, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
● Sarco Co., Inc., New York, N. Y.
Schaub Engineering Co., Fred H., Chicago, Ill.
Squires Co., C. E., Cleveland, O.
● Sterling, Inc., Milwaukee, Wis.
Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Templeton Bros., Inc., Walpole, Mass. (Return)
Templeton Mfg. Co., Hyde Park, Mass.
● Trane Co., The, LaCrosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Vapor Specialty Co., New York, N. Y.
Watson & McDaniel Co., Philadelphia, Pa.
● Webster & Co., Warren, Camden, N. J.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.
● Yarnall-Waring Co., Philadelphia, Pa.

## TRAPS, STEAM, THERMOSTATIC

All-Vac Steam Control System, Chicago, Ill.
● American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
Bishop & Babcock Mfg. Co., Cleveland, O.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
● Clifford Mfg. Co., Boston, Mass.
Cryer Trap & Valve Co., Inc., New York, N. Y.
● Dunham Co., C. A., Chicago, Ill.
● Haines & Co., William S., Philadelphia, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
Marsh Corp., Jas. P., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monash-Younker Co., Chicago, Ill.
Mouat Vapor Heating Co., The, Cleveland, O.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
● Sterling, Inc., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
● Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Trane Co., The, LaCrosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Vapor Car Heating Co., Inc., Chicago, Ill.
Vapor Specialty Co., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.

## TREATMENT, STEAM SYSTEM, TO INHIBIT CORROSION

Anderson-Stolz Corp., Kansas City, Mo.
Apex All Weather Products, Chicago, Ill.
Cannon Chemical Co., Everett, Mass.
Dowell, Inc., Tulsa, Okla.
Elgin Softener Corp., Elgin, Ill.
Graver Tank & Mfg. Co., Inc., East Chicago, Ill.
Haering Co., Inc., D. W., Chicago, Ill.
%Proportioneers, Inc.%, Providence, R. I.
Rid-Sludge Chemical Co., Minneapolis, Minn. (vapor treatment to remove sludge from heating system)
Turco Products, Inc., Los Angeles, Calif.
Vinco Co., Inc., The, New York, N. Y.
Water Treatment Co. of America, Pittsburgh, Pa.
Western Chemical Co., Kansas City, Mo.

## TREATMENT, WATER, TO INHIBIT CORROSION

Activator Process Sales Co., Alhambra, Calif.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American K. A. T. Corp., New York, N. Y.
American Water Softener Co., Philadelphia, Pa.
American Well Works, Aurora, Ill.
Anderson-Stolz Corp., Kansas City, Mo.
Aquatic Chemical Laboratories, Inc., New York, N. Y.
Automatic Pump & Softener Corp., Rockford, Ill.
Calgon, Inc., Pittsburgh, Pa.
● Cannon Chemical Co., Everett, Mass.
Cochrane Corp., Philadelphia, Pa.
Continental Products Co., Euclid, O.
Dearborn Chemical Co., Chicago, Ill.
Electroaire Corp., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
Ferro-Nil Corp., New York, N. Y.
Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Grief, Edward C., Bogota, N. J.
Haering Co., D. W., Chicago, Ill.
Hagan Corp., Pittsburgh, Pa.
Maintenance Engineering Corp., Houston, Tex.
Metropolitan Refining Co., Long Island City, N. Y.
Monsanto Chemical Co., Organic Chemicals Div., St. Louis, Mo.
Mutual Chemical Co. of America, New York, N. Y.
National Aluminate Corp., Chicago, Ill.
North American Fibre Products Co., The, Cleveland, O.
Norwood Filtration Co., The, Florence, Mass.
Oakite Products, Inc., New York, N. Y.
% Proportioneers, Inc., %, Providence, R. I.
Permutit Co., New York, N. Y.
R. U. V. Engineering Corp., South Norwalk, Conn.
Red Jacket Mfg. Co., Davenport, Ia.
Refinite Corp., Omaha, Nebr.
● Research Products Corp., Madison, Wis.
Solvay Sales Corp., New York, N. Y.
Sudbury Laboratory, South Sudbury, Mass.
Turco Products, Inc., Los Angeles, Calif.
Uniflow Mfg. Co., Erie, Pa.
Vinco Co., Inc., The, New York, N. Y.
Wallace & Tiernan Co., Inc., Newark, N. J.
Warlo Corp., New York, N. Y.
Water Refining Co., Ft. Wayne, Ind.
Water Service Laboratories, Inc., New York, N. Y.
Water Treatment Company of America, Pittsburgh, Pa.
Western Chemical Co., Kansas City, Mo.
Worthington Pump & Machinery Corp., Harrison, N. J.

## TRY-COCKS, BOILER

● Detroit Lubricator Co., Detroit, Mich.
Reliance Gauge Column Co., Cleveland, O.

## TUBE CLEANERS

*See Cleaners, Tube*

## TUBES, BOILER

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Co., New York, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Detroit Seamless Steel Tubes Co., Detroit, Mich.
Globe Steel Tubes Co., Milwaukee, Wis.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Standard Tube Co., Highland Park, Mich.
Steel & Tubes Div., Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.

## TUBES, PITOT

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Defender Instrument and Regulator Co., St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
Hill, E. Vernon, Chicago, Ill.
Meriam Instrument Co., The, Cleveland, O.

## TUBING, ALUMINUM

Aluminum Co. of America, Pittsburgh, Pa.
Brasco Mfg. Co., Harvey, Ill.
Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
● Revere Copper and Brass Incorporated, New York, N. Y.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

## TUBING BENDERS

*See Benders, Tubing*

## TUBING, BRASS AND COPPER

● American Brass Co., Waterbury, Conn.
Brasco Mfg. Co., Harvey, Ill.
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
● Mueller Brass Co., Port Huron, Mich.
Phelps Dodge Copper Products Corp., British American Tube Div., New York, N. Y.
● Revere Copper and Brass Incorporated, New York, N. Y.
Roberts Tube Works, Detroit, Mich.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

## TUBING CUTTERS

*See Cutters, Tubing*

## TUBING, FINNED

● Aerofin Corp., Syracuse, N. Y.
Brown Fintube Co., The, Elyria, O.
● Bush Mfg. Co., Hartford, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
● Extended Surface, Inc., Brooklyn, N. Y.
● G. & O. Mfg. Co., New Haven, Conn.
Griscom-Russell Co., The, New York, N. Y.
Industrial Mfg. & Engineering Co., Chicago, Ill.
● Kramer Trenton Co., Trenton, N. J.
Manufacturers Fin Coil Co., Chicago, Ill.
● McCord Corp., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
Peerless of America, Inc., Marion, Ind.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Vapor Car Heating Co., Inc., Chicago, Ill.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich. (Aluminum, copper)

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## TUBING, NICKEL AND NICKEL ALLOY

Brasco Mfg. Co., Harvey, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Globe Steel Tubes Co., Milwaukee, Wis.
International Nickel Co., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Revere Copper and Brass Incorporated, New York, N. Y.
● Western Brass Mill Div., Olin Industries, Inc., East Alton, Ill.

## TUBING, PLASTIC

Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.
Carter Products Corp., Cleveland, O.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Commercial Plastics Co., Chicago, Ill.
Extruded Plastics, Inc., Norwalk, Conn.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Plastics Div., Pittsfield, Mass.
Goodrich Co., B. F., Akron, O.
Hodgman Rubber Co., Framingham, Mass.
Irvington Varnish and Insulator Co., Irvington, N. J.
Mills Corp., Elmer E., Chicago, Ill.
North Penn Co., New York, N. Y.
Parker Appliance Co., The, Cleveland, O.
Resistoflex Corp., Belleville, N. J.
Sandee Mfg. Co., Chicago, Ill.
Skuttle Mfg. Co., Detroit, Mich.
United States Stoneware Co., New York, N. Y.
Werner Co., Inc., R. D., New York, N. Y.
Yardley Plastics Co., Columbus, O.

## TUBING, SILVER CLAD AND SILVER ALLOY

General Plate Div., Metals & Controls Corp., Attleboro, Mass.

## TUBING, STEEL, ALLOY, SEAMLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Detroit Seamless Steel Tubes Co., Detroit, Mich.
Globe Steel Tubes Co., Milwaukee, Wis.
National Tube Co., United States Steel Corp., Subsidiary, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

## TUBING, STEEL, ALLOY, WELDED

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Carpenter Steel Co., The, Welded Alloy Tube Div., Kenilworth, N. J.
Duraloy Co., Scottdale, Pa.
Laclede Steel Co., St. Louis, Mo.
● Revere Copper and Brass Incorporated, New York, N. Y.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Steel and Tubes Div., Republic Steel Corp., Cleveland, O.
Trent Tube Mfg. Co., East Troy, Wis.
● Youngstown Sheet & Tube Co., Youngstown, O.

## TUBING, STEEL, SEAMLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Detroit Seamless Steel Tubes Co., Detroit, Mich.
Globe Steel Tubes Co., Milwaukee, Wis.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
National Tube Co., United States Steel Corp., Subsidiary, Pittsburgh, Pa.
Pipe and Tube Products, Inc., Jersey City, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

## TUBING, STEEL, WELDED

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Welded Tube Div., Alliance, O.
Bunday Tubing Co., Detroit, Mich.
Carpenter Steel Co., The, Welded Alloy Tube Div., Kenilworth, N. J.
Everhot Products Co., Chicago, Ill.
● Flori Pipe Co., The, St. Louis, Mo.
Globe Steel Tubes Co., Milwaukee, Wis.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Tube Co., Pittsburgh, Pa.
● Revere Copper and Brass Incorporated, New York, N. Y.
South Chester Tube Co., Chester, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Standard Tube Co., Highland Park, Mich.
Steel and Tubes Div., Republic Steel Corp., Cleveland, O.
Wheatland Tube Co., Philadelphia, Pa.
● Youngstown Sheet & Tube Co., Youngstown, O.

## TURBINES, MECHANICAL DRIVE

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Carling Blower Co., Worcester, Mass.
Coppus Engineering Corp, Worcester, Mass.
Dean Hill Pump Co., Indianapolis, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Elliott Co., Jeannette, Pa.
General Electric Co., Schenectady, N. Y.
Moore Steam Turbine Div., Worthington Pump and Machinery Corp., Wellsville, N. Y.
Murray Iron Wks. Co., Burlington, Ia.
Pyle-National Co., The, Chicago, Ill.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
● Wing Mfg. Co., L. J., New York, N. Y.

## 2, 3 AND 4-WAY VALVES

*See Valves, 2, 3 and 4-way*

## UNDERGROUND PIPING

*See Conduit, Underground Piping*

## UNIONS, BRASS

Acheson Mfg. Co., Rankin, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Bowser, Inc., Fort Wayne, Ind.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
● General Fittings Co., Providence, R. I.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Hays Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Leavitt Machine Co., Orange, Mass.
Lunkenheimer Co., Cincinnati, O.
● Mueller Brass Co., Port Huron, Mich.
Parker Appliance Co., Cleveland, O.
Phoenix Brass Fittings Corp., Irvington, N. J.
Powell Co., Wm., Cincinnati, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
● Schaible Co., The, Cincinnati, O.
Union Metal Works, Chelsea, Mass.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P. Blossburg, Pa.
Williams Valve Co., D. T., Cincinnati, O.

## UNIONS, MALLEABLE, BRASS SEAT

Corley Co., Jersey City, N. J.
● Crane Co., Chicago, Ill.
Dart Mfg. Co., E. M., Providence, R. I.
Detroit Brass & Malleable Wks., Detroit, Mich.
Fairbanks Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
● General Fittings Co., Providence, R. I.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jefferson Union Co., Inc., Lockport, N. Y.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Malleable Iron Fittings Co., Branford, Conn.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Rockwood Sprinkler Co., Worcester, Mass.
Star Mfg. Co., Inc., Providence, R. I.
Stockham Pipe Fittings Co., Birmingham, Ala.
United Superior Union Co., Inc., Brooklyn, N. Y.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburg, Pa.

## UNIONS, STEEL

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Catawissa Valve & Fittings Co., Catawissa, Pa.
Champion Machine & Forging Co., Cleveland, O.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
● Crane Co., Chicago, Ill.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Rockwood Sprinkler Co., Worcester, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

## UNIT COOLERS

*See Coolers, Unit*

## UNIT HEATERS

*See Heaters, Unit*

## UNIT VENTILATORS

*See Ventilators, Unit*

## UNITS, AIR CONDITIONING, CENTRAL STATION TYPE

*Self contained blower, heating and/or cooling coil, filter, humidifier unit for remote location and duct air distribution*

● Air & Refrigeration Corp., New York, N. Y.
● Airtemp Div. of Chrysler Corp., Dayton, O.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.

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American Blower Corp., Detroit, Mich.
American Cooling Tower Co., Kansas City, Mo.
Anetsberger Bros., Chicago, Ill.
• Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Betz Corp., Hammond, Ind.
• Bryant Heater Co., The, Cleveland, O.
• Buffalo Forge Co., Buffalo, N. Y.
Carrier Corp., Syracuse, N. Y.
• Clarage Fan Co., Kalamazoo, Mich.
• Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
• Drayer & Hanson, Inc., Los Angeles, Calif.
Drying Systems, Inc., Chicago, Ill.
• Fedders Mfg. Co., Inc., Buffalo, N. Y.
Forman Air Conditioning & Engrg. Co., New York, N. Y.
Frigidaire Div., General Motors Corp., Dayton, O.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Hastings Air Conditioning Co., Hastings, Neb.
Howe Ice Machine Co., Chicago, Ill.
• Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Hastings, Neb.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
• Kramer Trenton Co., Trenton, N. J.
• Marlo Coil Co., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
Micheli Air Conditioning Co., Inc., Schenectady, N. Y.
Niagara Blower Co., New York, N. Y.
• Palmer Mfg. Corp., Phoenix, Ariz.
Parks-Cramer Co., Fitchburg, Mass.
Pernot & Rich, Inc., Los Angeles, Calif.
Refrigeration Economics Co., Inc., Canton, O.
• Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Stainless & Steel Products Co., St. Paul, Minn.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
• Sturtevant Co., B. F., Hyde Park, Boston, Mass.
• Surface Combustion, Toledo, O.
• Trane Co., The, La Crosse, Wis.
• United States Air Conditioning Corp., Minneapolis, Minn.
United States Radiator Corp., Detroit, Mich.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
• York Corp., York, Pa.
• Young Radiator Co., Racine, Wis.

## UNITS, AIR CONDITIONING, HORIZONTAL PACKAGE TYPE

*Self contained blower, cooling and/or heating coil, filter, humidifier unit for ceiling or platform location in space condition, for connection to remote compressor or cold water supply, and steam or hot water*

• Airtemp, Div. of Chrysler Corp., Dayton, O.
American Blower Corp., Detroit, Mich.
• Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Betz Corp., Hammond, Ind.
• Buffalo Forge Co., Buffalo, N. Y.
Carrier Corp., Syracuse, N. Y.
Champion Unit Heater Co., Chicago, Ill.
• Clarage Fan Co., Kalamazoo, Mich.
Conditionaire Unit Co., Chicago, Ill.
• Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
• Drayer & Hanson, Inc., Los Angeles, Calif.
Drying Systems, Inc., Chicago, Ill.
• Fedders Mfg. Co., Inc., Buffalo, N. Y.
Frigidaire Div., General Motors Corp., Dayton, O.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Hastings Air Conditioning Co., Hastings, Neb.
• Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Hastings, Neb.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
King Ventilating Co., Owatonna, Minn.
• Kramer Trenton Co., Trenton, N. J.
• Marlo Coil Co., St. Louis, Mo.
Mayflower Air-Conditioners, Inc., St. Paul, Minn.
McQuay, Inc., Minneapolis, Minn.
Niagara Blower Co., New York, N. Y.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
• Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Stainless & Steel Products Co., St. Paul, Minn.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
• Sturtevant Co., B. F., Boston, Mass.
• Trane Co., The, La Crosse, Wis.
• United States Air Conditioning Corp., Minneapolis, Minn.
United States Radiator Corp., Detroit, Mich.
Vilter Mfg. Co., Milwaukee, Wis.
Western Blower Co., Seattle, Wash.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
• York Corp., York, Pa.
• Young Radiator Co., Racine, Wis.

## UNITS, AIR CONDITIONING, INDUSTRIAL TYPE

• Air & Refrigeration Corp., New York, N. Y.
American Blower Corp., Detroit, Mich.
American Coils Inc., Newark, N. J.
American Cooling Tower Co., Kansas City, Mo.
Anetsberger Bros., Chicago, Ill.
Bahnson Co., Winston-Salem, N. C.
• Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Betz Corp., Hammond, Ind.
• Bryant Heater Co., The, Cleveland, O.
• Buffalo Forge Co., Buffalo, N. Y.
Carrier Corp., Syracuse, N. Y.
• Clarage Fan Co., Kalamazoo, Mich.
• Curtis Refrigeration Machine Div., Curtis Mfg. Co., St. Louis, Mo.
• Drayer & Hanson, Inc., Los Angeles, Calif.
Drying Systems, Inc., Chicago, Ill.
Economy Equipment Co., Inc., Chicago, Ill.
• Fedders Mfg. Co., Inc., Buffalo, N. Y.
Frick Co., Waynesboro, Pa.
General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
• Ingersoll-Rand Co., New York, N. Y.
International Moistening Co., Providence, R. I.
Jaden Mfg. Co., Hastings, Neb.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
• Kramer Trenton Co., Trenton, N. J.
Lintern Co., Berea, O.
• Marlo Coil Co., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
Niagara Blower Co., New York, N. Y.
Norwood Filtration Co., The, Florence, Mass.
Parks-Cramer Co., Fitchburg, Mass.
Pfening Co., Fred D., Columbus, O.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Research Corp., New York, N. Y.
Ross Engineering Corp., J. O., New York, N. Y.
• Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Somers, Inc., H. J., Detroit, Mich.
• Sturtevant Co., B. F., Hyde Park, Boston, Mass.
• Surface Combustion, Toledo, O.
Tenney Engineering, Inc., Montclair, N. J. (including test chambers)
• Trane Co., The, La Crosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
• York Corp., York, Pa.
• Young Radiator Co., Racine, Wis.

## UNITS, AIR CONDITIONING, SUMMER, EVAPORATIVE COOLING TYPE

*For cooling with sprays, no dehumidification*

• Air & Refrigeration Corp., New York, N. Y.
American Blower Corp., Detroit, Mich.
American Cooling Tower Co., Kansas City, Mo.
American Metal Products Co., Fort Worth, Tex.
April Showers Co., Washington, D. C.
Aqua-Mist Co., Topeka, Kans.
Bahnson Co., Winston-Salem, N. C.
Beacon-Morris Corp., Boston, Mass.
Beckett & Co., Thomas, Dallas, Tex.
Bien Air Conditioning Co., Bell, Calif.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
Dallas Engineering Co., Inc., Dallas, Tex.
Drying Systems, Inc., Chicago, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Essick Mfg. Co., Los Angeles, Calif.
Farr Co., Los Angeles, Calif.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Great National Air Conditioning Co., Dallas, Tex.
International Sales Co., San Francisco, Calif.
Montag Stove & Furnace Works, Portland, Ore.
Mountain States Equipment Co., Denver, Colo.
National Engineering & Mfg. Co., Kansas City, Mo.
Niagara Blower Co., New York, N. Y.
• Palmer Mfg. Corp., Phoenix, Ariz.
Pernot & Rich, Inc., Los Angeles, Calif.

• Advertisement in this issue. See Index to Advertisers, page 350.

Reynolds Mfg. Co., Inc., Springfield, Mo.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Shreveport Engineering Co., Inc., Shreveport, La.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Western Blower Co., Seattle, Wash.
X L Refrigerating Co., Chicago, Ill.

## UNITS, AIR CONDITIONING, SUMMER, ROOM TYPE, FLOOR CABINET, REMOTE COMPRESSOR OR COLD WATER, UNDER 3 TONS CAPACITY

*Self contained blower, coil, filter unit for connection to remote compressor or cold water supply*

Airgard Mfg. Co., Chicago, Ill.
● Airtemp, Div. of Chrysler Corp., Dayton, O.
American Coils Inc., Newark, N. J.
Carrier Corp., Syracuse, N. Y.
General Air Conditioning Corp., Cincinnati, O.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
Giant Mfg. Co., Council Bluffs, Ia.
Hastings Air Conditioning Co., Hastings, Neb.
● Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Hastings, Neb.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kennard Corp., St. Louis, Mo.
King Ventilating Co., Owatonna, Minn.
McQuay, Inc., Minneapolis, Minn.
Norwin Co., Freeport, Ill.
Peerless of America, Inc., Marion, Ind.
Premier Furnace Co., Dowagiac, Mich.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Scott-Newcomb, Inc., St. Louis, Mo.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
● Trane Co., The, La Crosse, Wis.
Unified Air Conditioner Co., Duluth, Minn.
Viking Mfg. Corp., Dayton, O.
X L Refrigerating Co., Chicago, Ill.
● York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

## UNITS, AIR CONDITIONING, SUMMER, ROOM TYPE, FLOOR CABINET, SELF CONTAINED COMPRESSOR, UNDER 3 HP

*Self contained blower, coil, compressor, filter unit*

● Airtemp, Div. of Chrysler Corp., Dayton, O.
Carrier Corp., Syracuse, N. Y.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
Ice Cooling Appliance Corp., Morrison, Ill. (Ice)
● Ilg Electric Ventilating Co., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Peerless of America, Inc., Marion, Ind.
Philco Corp., Philadelphia, Pa.
Pleasantaire Corp. of America, Washington, D. C.
Premier Furnace Co., Dowagiac, Mich.
Scott-Newcomb, Inc., St. Louis, Mo.
● York Corp., York, Pa.

## UNITS, AIR CONDITIONING, SUMMER, STORE TYPE, FLOOR CABINET, SELF CONTAINED COMPRESSOR, 3 HP AND OVER

*Self contained blower, coil, compressor, filter unit with air discharge approximately 6 ft above floor*

● Airtemp, Div. of Chrysler Corp., Dayton, O.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Brunner Mfg. Co., Utica, N. Y.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
Forman Air Conditioning & Engrg. Co., New York, N. Y.
Frick Co., Waynesboro, Pa.
Frigidaire Div., General Motors Corp., Dayton, O.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Nevinger Mfg. Co., Inc., Greenville, Ill.
Peerless of America, Inc., Marion, Ind.
Refrigeration Appliances, Inc., Chicago, Ill.
Scott-Newcomb, Inc., St. Louis, Mo.
● Trane Co., The, LaCrosse, Wis.
Viking Mfg. Corp., Dayton, O.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
● York Corp., York, Pa.

## UNITS, AIR CONDITIONING, WINTER, ROOM TYPE, FLOOR CABINET

*Self contained blower, filter, heating coil, humidifier unit*

● Air & Refrigeration Corp., New York, N. Y.
Aladdin Heating Corp., Oakland, Calif.
Campbell Heating Co., Des Moines, Ia.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
● Fitzgibbons Boiler Co., Inc., New York, N. Y.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
● Ilg Electric Ventilating Co., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kehm Corp., The, Chicago, Ill.
Kennard Corp., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
Peerless of America, Inc., Marion, Ind.
Refrigeration Economics Co., Inc., Canton, O.
● Reznor Mfg. Co., Mercer, Pa.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Somers, Inc., H. J., Detroit, Mich.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
● Surface Combustion, Toledo, O.
● Trane Co., The, La Crosse, Wis.
Unified Air Conditioner Co., Duluth, Minn.
● United States Air Conditioning Corp., Minneapolis, Minn.
Viking Mfg. Corp., Dayton, O.
● York Corp., York, Pa.

## UNITS, AIR CONDITIONING, YEAR AROUND, ROOM TYPE, FLOOR CABINET

*Self contained blower, cooling and heating coil, filter, humidifier unit for connection to remote compressor or cold water supply, and steam or hot water supply*

● Air & Refrigeration Corp., New York, N. Y.
● Airtemp, Div. of Chrysler Corp., Dayton, O.
American Coils, Inc., Newark, N. J.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
● Curtis Refrigerating Machine Div., Curtis Mfg. Co., St. Louis, Mo.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Hastings Air Conditioning Co., Hastings, Neb.
● Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Hastings, Neb.
Johnson Co., S. T., Oakland, Calif.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kelvinator Div., Nash-Kelvinator Corp., Detroit, Mich.
Kennard Corp., St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
● Marlo Coil Co., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Marion, Ind.
Refrigeration Economics Co., Inc., Canton, O.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
● Trane Co., The, La Crosse, Wis.
Unified Air Conditioner Co., Duluth, Minn.
● York Corp., York, Pa.

## UNITS, WINDOW VENTILATOR AND FILTER

Airgard Mfg. Co., Chicago, Ill.
American Air Conditioning Co., Detroit, Mich.
Automatic Ventilator Co., Corunna, Mich.
Berger Mfg. Div., Republic Steel Corp., Canton, O.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
● Ilg Electric Ventilating Co., Chicago, Ill.
Kaiser Co., H. S., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Meier Electric & Machine Co., Indianapolis, Ind.
Mellish & Murray Co., Chicago, Ill.
Reed Unit-Fans, Inc., New Orleans, La.
Reliable Sheet Metal Engineering Co., Chicago, Ill.
Somers, Inc., H. J., Detroit, Mich.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
Unified Air Conditioner Co., Duluth, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Vita-Screen Ventilator Co., New York, N. Y.

## UNIVERSAL JOINTS

*See Joints, Universal, for Operating Valves*

## VACUUM GAGES

*See Gages, Indicating, Vacuum*

## VACUUM HEATING SYSTEMS

*See Systems, Heating, Vacuum*

## VACUUM PUMPS

*See Pumps, Vacuum*

## VACUUM RECORDERS

*See Recorders, Pressure and Vacuum*

## VALVE OPERATORS

*See Operators, Valve*

## VALVE RESEATERS

*See Reseaters, Valve*

## VALVES, ANGLE

Albright Equipment Co., Johnstown, Pa.
Alloy Steel Products Co., Linden, N. J. (Stainless steel)

● Advertisement in this issue. See Index to Advertisers, page 350.

● American Brass Co., Waterbury, Conn.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Bordo Co., Inc., L. J., Glenside, Pa. (Plug)
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Central Brass Mfg. Co., Cleveland, O.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
Farris Engineering Co., Palisades Park, N. J.
Gorton Heating Corp., Cranford, N. J.
● Grinnell Co., Inc., Providence, R. I.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Milwaukee Valve Co., Milwaukee, Wis.
● Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Stockham Pipe Fittings Co., Birmingham, Ala.
Strong, Carlisle & Hammond Co., Cleveland, O
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J. (hydraulic service)
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, BALANCING, RADIATOR, FOR FORCED HOT WATER HEATING SYSTEMS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Hammond Brass Works, Hammond, Ind.
Marsh Valve Co., Dunkirk, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
● Schaible Co., The, Cincinnati, O.
● Trane Co., The, LaCrosse, Wis.

## VALVES, BLOW-OFF

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Babcock & Wilcox Co., New York, N. Y.
Barrett Machine Co., N. S. Pittsburgh, Pa.
Bordo Co., Inc., L. J., Glenside, Pa.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Elliott Co., Jeannette, Pa.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
Keckley Co., O. C., Chicago, Ill.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
● McDonnell & Miller, Chicago, Ill.
Norgren Co., C. A., Denver, Colo.
Ohio Injector Co., Wadsworth, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Powell Co., Wm., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Walworth Co., New York, N. Y.
● Yarnall-Waring Co., Philadelphia, Pa.

## VALVES, CHECK

● Aeroquip Corp., Jackson, Mich.
Albright Equipment Co., Johnstown, Pa.
Alloy Steel Products Co., Linden, N. J. (Stainless steel)
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Barrett, Haentjens & Co., Hazleton, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Detroit Brass & Malleable Wks., Detroit, Mich.
Durabla Mfg. Co., New York, N. Y.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Electrol Mfg. Co., Passaic, N. J.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Foster Engineering Co., Newark, N. J.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Grinnell Co., Inc., Providence, R. I.
Hammond Brass Works, Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
● Mueller Brass Co., Port Huron, Mich.
Norgren Co., C. A., Denver, Colo.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
Preferred Utilities Mfg. Corp., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass. (Bleeder type)
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Smolensky Valve Co., Inc., Bedford, O.
Stockham Pipe Fittings Co., Birmingham, Ala.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Strong, Carlisle & Hammond Co., Cleveland, O.
Taco Heaters, Inc., New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Gauge Co., Pittsburgh, Pa. (Noiseless)
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, COMPRESSOR

Cash Valve Mfg. Co., A. W., Decatur, Ill.
● Detroit Stamping Co., Detroit, Mich.
Durabla Mfg. Co., New York, N. Y.
Frick Co., Waynesboro, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
● Jenkins Bros., New York, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
Kunkle Valve Co., Ft. Wayne, Ind.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Voss Co., J. H. H., New York, N. Y.

## VALVES, DIAPHRAGM

American Hard Rubber Co., New York, N. Y. (Rubber lined)
American Schaeffer & Budenberg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
Atlas Valve Co., Inc., Newark, N. J.
Belfield Co., H., Philadelphia, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Eclipse Fuel Engineering Co., Rockford, Ill.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Grinnell Co., Providence, R. I.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
Henry Valve Co., Chicago, Ill.

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● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Kainer & Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Kunkle Valve Co., Ft. Wayne, Ind.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Mueller Brass Co., Port Huron, Mich.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
Northern Indiana Brass Co., Elkhart, Ind.
Parks-Cramer Co., Fitchburg, Mass.
Powell Co., Wm., Cincinnati, O.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Spencer Thermostat Co., Attleboro, Mass.
Staples & Pfeiffer, San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
● White-Rodgers Electric Co., St. Louis, Mo.

## VALVES, FIRE PROTECTION, SPRINKLER SYSTEM CONTROL

● Barber-Colman Co., Rockford, Ill.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
Hodgman Mfg. Co., Taunton, Mass.
Ohio Injector Co., Wadsworth, O.
Raisler Corp., Grimes Sprinkler Div., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rockwood Sprinkler Co., Worcester, Mass.
Ross Sprinkler Co., Pasadena, Calif.

## VALVES, FLOAT

Albright Equipment Co., Johnstown, Pa.
● Alco Valve Co., St. Louis, Mo.
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Atlas Valve Co., Inc., Newark, N. J.
● Automatic Products Co., Milwaukee, Wis. (Oil)
Beckett & Co., Thomas, Dallas, Tex.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Caldwell Co., W. E., Louisville, Ky.
● Cash Co., A. W., Decatur, Ill.
Central Brass Mfg. Co., Cleveland, O.
Cleveland Humidifier Co., Cleveland, O.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Frick Co., Waynesboro, Pa.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
● Illinois Engineering Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Locke Regulator Co., Salem, Mass.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
● Maid-O'-Mist, Inc., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Monash-Younker Co., Chicago, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Phillips & Co., H. A., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Skuttle Mfg. Co., Detroit, Mich.
Spence Engineering Co., Inc., Walden, N. Y.
Stickle Steam Specialties Co., Indianapolis, Ind.
● Swartwout Co., Cleveland, O.
● Trane Co., The, La Crosse, Wis.
Viking Air Conditioning Corp., Cleveland, O.
Voss Co., J. H. H., New York, N. Y.
Watts Regulator Co., Lawrence, Mass.

## VALVES, FLOW CONTROL, FOR HOT WATER HEATING SYSTEMS

● Bell & Gossett Co., Morton Grove, Ill.
● Illinois Engineering Co., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
● Schaible Co., The, Cincinnati, O.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.

## VALVES, FORGED STEEL

Albright Equipment Co., Johnstown, Pa.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Henry Valve Co., Chicago, Ill.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Schutte & Koerting Co., Philadelphia, Pa.
Steel Improvement & Forge Co., Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

## VALVES, GATE, ALLOY

Alloy Steel Products Co., Linden, N. J.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Hasco Valve & Machine Co., Milwaukee, Wis.
● Jenkins Bros., New York, N. Y.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Ohio Injector Co., Wadsworth, O.
Powell Co., Wm., Cincinnati, O.
● Walworth Co., New York, N. Y.

## VALVES, GATE, BRASS AND BRONZE

● American Brass Co., Waterbury, Conn.
Belknap Mfg. Co., Bridgeport, Conn.
Bordo Co., Inc., L. J., Glenside, Pa.
Capitol Brass Works, Div. of Bohn Aluminum Brass Corp., Detroit, Mich.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Detroit Brass & Malleable Wks., Detroit, Mich.
Eddy Valve Co., Waterford, N. Y.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Hammond Brass Wks., Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
Ostlind Valve, Inc., Portland, Ore.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
● Schaible Co., The, Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Stockham Pipe Fittings Co., Birmingham, Ala.
● Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, GATE, IRON BODY

Bordo Co., Inc., L. J., Glenside, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.

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Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Ohio Injector Co., Wadsworth, O.
Pittsburgh Valve & Fittings Co., Barberton, O.
Powell Co., Wm., Cincinnati, O.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
Scott Valve Mfg. Co., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
● Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, GATE, MALLEABLE IRON

● Crane Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

## VALVES, GATE, STEEL

American Hard Rubber Co., New York, N. Y.
Bordo Co., Inc., L. J., Glenside, Pa.
Central Brass Mfg. Co., Cleveland, O.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Everlasting Valve Co., Jersey City, N. J.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Jenkins Bros., New York, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
National Radiator Co., The, Johnstown, Pa.
Ohio Injector Co., Wadsworth, O.
Powell Co., Wm., Cincinnati, O.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.

## VALVES, GLOBE, ALLOY

Alloy Steel Products Co., Linden, N. J.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Hasco Valve & Machine Co., Milwaukee, Wis.
● Jenkins Bros., New York, N. Y.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Ohio Injector Co., Wadsworth, O.
Powell Co., Wm., Cincinnati, O.
● Walworth Co., New York, N. Y.

## VALVES, GLOBE, BRASS AND BRONZE

● American Brass Co., Waterbury, Conn.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Bowser, Inc., Fort Wayne, Ind.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Central Valve Mfg. Co., Chicago, Ill.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
● Grinnell Co., Inc., Providence, R. I.
Hammond Brass Wks., Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Newman Brothers, Inc., Cincinnati, O.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Ostlind Valve, Inc., Portland, Ore.
Parker Appliance Co., The, Cleveland, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Stockham Pipe Fittings Co., Birmingham, Ala.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. Y. (Hydraulic service)
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, GLOBE, IRON BODY

Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Cyrus Shank Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
● Grinnell Co., Inc., Providence, R. I.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Shank Co., Cyrus, Chicago, Ill.
● Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, GLOBE, MALLEABLE IRON

● Crane Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

## VALVES, GLOBE, STEEL

Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
Klingerit, Inc., New York, N. Y.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Ostlind Valve, Inc., Portland, Ore.
Parker Appliance Co., Cleveland, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland, O.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

## VALVES, LINED

American Hard Rubber Co., New York, N. Y. (Hard rubber lined)
American Smelting & Refining Co., New York, N. Y.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Goodrich Co., B. F., Akron, O. (Rubber lined)
● Grinnell Co., Inc., Providence, R. I.
Hasco Valve & Machine Co., Milwaukee, Wis. (Rubber)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead or tin)
● McAlear Mfg. Co., Chicago, Ill.
National Lead Co., New York, N. Y. (Lead)
Northern Indiana Brass Co., Elkhart, Ind. (Tinned)
Resisto Pipe & Valve Co., East Cambridge, Mass. (Lead)
Schutte & Koerting Co., Philadelphia, Pa. (Lead)
United States Rubber Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.

## VALVES, MIXING, HOT AND COLD WATER

Boiler Room Equipment, Inc., New York, N. Y.
Carrier Corp., Syracuse, N. Y.
● Crane Co., Chicago, Ill.
● Dole Valve Co., The, Chicago, Ill.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Fittings Co., Providence, R. I.
Lawler Automatic Controls, Mount Vernon, N. Y.
● McAlear Mfg. Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
● Schaible Co., The, Cincinnati, O.
Thermo-Mix, Inc., Long Island City, N. Y.
Watts Regulator Co., Lawrence, Mass.

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## VALVES, MIXING, STEAM AND WATER

Central Brass Mfg. Co., Cleveland, O.
Cooper Co., Clark, Palmyra, N. J.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Fittings Co., Providence, R. I.
● Johnson Service Co., Milwaukee, Wis.
Leonard Valve Co., Providence, R. I.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Vapor Car Heating Co., Inc., Chicago, Ill.

## VALVES, MOTOR OPERATED

● Alco Valve Co., St. Louis, Mo.
Armstrong Heat Control Co., Portland, Ore.
● Au-Temp-Co Corp., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
● Bell & Gossett Co., Morton Grove, Ill.
Bristol Co., Waterbury, Conn.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Cutler-Hammer, Inc., Milwaukee, Wis.
Darling Valve & Mfg. Co., Williamsport, Pa.
Davis Regulator Co., Chicago, Ill.
Eddy Valve Co., Waterford, N. Y.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
Foxboro Co., Foxboro, Mass.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Hasco Valve & Machine Co., Milwaukee, Wis.
Homestead Valve Mfg. Co., Coraopolis, Pa.
● Illinois Engineering Co., Chicago, Ill.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
● Kieley & Mueller, Inc., North Bergen, N. J.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Mason-Neilan Regulator Co., Boston, Mass.
● Mercoid Corp., Chicago, Ill.
Merco-Nordstrom Valve Co., Pittsburgh, Pa.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Philadelphia Gear Works, Inc., Philadelphia, Pa.
Powell Co., Wm., Cincinnati, O.
Preferred Utilities Mfg. Corp., New York, N. Y.
R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Tallmadge & Co., Webster, East Orange, N. J.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Vapor Car Heating Co., Inc., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.
Webster Tallmadge & Co., East Orange, N. J.

## VALVES, NEEDLE

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
● Automatic Products Co., Milwaukee, Wis. (Oil)
Beckett & Co., Thomas, Dallas, Tex.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Cyrus Shank Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Detroit Brass & Malleable Wks., Detroit, Mich.
● Detroit Lubricator Co., Detroit, Mich.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
● Flori Pipe Co., The, St. Louis, Mo.
Grove Regulator Co., Oakland, Calif.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hanlon-Waters, Tulsa, Okla.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Lunkenheimer Co., Cincinnati, O.
● Maid-O'-Mist, Inc., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Norgren Co., C. A., Denver, Colo.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Parker Appliance Co., Cleveland, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Shank Co., Cyrus, Chicago, Ill.
● Taylor Instrument Companies, Rochester, N. Y.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, PLASTIC

Haveg Corp., Newark, Del.

## VALVES, PLUG

Alten's Foundry & Machine Works, Lancaster, O.
American Car & Foundry Co., New York, N. Y.
Barrett, Haentjens & Co., Hazleton, Pa.
Barrett Machine Co., N. S. Pittsburgh, Pa.
Bordo Co., Inc., L. J., Glenside, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
● Crane Co., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Eddy Valve Co., Waterford, N. Y.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Hamer Oil Tool Co., Long Beach, Calif.
Hasco Valve & Machine Co., Milwaukee, Wis.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Inner-Tite Clamp Corp., Elizabeth, N. J.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Knight, Maurice A., Akron, O. (Stoneware)
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Merco-Nordstrom Valve Co., Pittsburgh, Pa. (Lubricated)
Mueller Co., Decatur, Ill.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Injector Co., Wadsworth, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Ostlind Valve, Inc., Portland, Ore.
Parker Appliance Co., The, Cleveland, O.
Pittsburgh Brass Mfg. Co., Pittsburgh, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
● Taylor Instrument Companies, Rochester, N. Y.
● Walworth Co., New York, N. Y.
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, PRESSURE REDUCING AND REGULATING, AIR AND GAS

Atlas Valve Co., Inc., Newark, N. J.
Belfield Co., H., Philadelphia, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Boylston Steam Specialty Co., Chicago, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Central Brass Mfg. Co., Cleveland, O.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
Eclipse Fuel Engineering Co., Rockford, Ill.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
Hubbell Corp., Chicago, Ill.
● Illinois Engineering Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Liquid Carbonic Corp., The, Chicago, Ill.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
Modern Engineering Co., St. Louis, Mo.
Moore Products Co., Philadelphia, Pa.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
Northern Equipment Co., Erie, Pa.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Roberts-Gordon Appliance Corp., Buffalo, N. Y.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Squires Co., C. E., Cleveland, O.
Staples & Pfeiffer, San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Sullivan Valve & Engineering Co., Butte, Mont.
● Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.

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Tallmadge & Co., Webster, East Orange, N. J.
● Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Tryco Products, Inc., Westfield, Mass.
Voss Co., J. H. H., New York, N. Y.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
Webster Tallmadge & Co., East Orange, N. J.
White Flo-Matic Corp., Hoosick Falls, N. Y.

## VALVES, PRESSURE REDUCING AND REGULATING, HOT WATER

● Bell & Gossett Co., Morton Grove, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Hanlon-Waters, Tulsa, Okla.
● Illinois Engineering Co., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
● McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

## VALVES, PRESSURE REDUCING AND REGULATING, STEAM

All-Vac Steam Control System, Chicago, Ill.
● American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Inc., Newark, N. J.
Bailey Meter Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Central Brass Mfg. Co., Cleveland, O.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Davis Regulator Co., Chicago, Ill.
Defender Instrument and Regulator Co., St. Louis, Mo.
● Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
● Fulton Sylphon Co., The, Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Tulsa, Okla.
Hubbell Corp., Chicago, Ill.
● Illinois Engineering Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lynhurst, N. J.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Northern Equipment Co., Erie, Pa.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Squires Co., C. E., Cleveland, O.
Staples & Pfeiffer, San Francisco, Calif.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
● Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Vapor Car Heating Co., Inc., Chicago, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
Webster Tallmadge & Co., East Orange, N. J.
White Flo-Matic Corp., Hoosick Falls, N. Y.

## VALVES, PUMP

Anchor Packing Co., Philadelphia, Pa.
Berger Bros. Co., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
Durabla Mfg. Co., New York, N. Y.
Garlock Packing Co., Palmyra, N. Y.
Quaker Rubber Corp., Philadelphia, Pa.
Williams Gauge Co., Pittsburgh, Pa.

## VALVES, RADIATOR, AIR

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
Anderson Products, Inc., Cambridge, Mass.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Burnham Boiler Corp., Irvington, N. Y.
Chicago Specialty Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Dole Valve Co., The, Chicago, Ill.
Gorton Heating Corp., Cranford, N. J.
● Hoffman Specialty Co., Indianapolis, Ind.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros, New York, N. Y.
Keeney Mfg. Co., Newington, Conn.
● Little Mfg. Co., M. S., Hartford, Conn.
● Maid-O'-Mist, Inc., Chicago, Ill. (Humidifying)
Marsh Corp., Jas. P., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
National Metal Products Corp., Chicago, Ill.
New York Air Valve Corp., New York, N. Y.
● Schaible Co., The, Cincinnati, O.
Slater Mfg. Co., Wakefield, Mass.
● Sullivan Valve & Engineering Co., Butte, Mont.
● Trane Co., The, LaCrosse, Wis.

## VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, ELECTRIC

● Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Electric Valve Mfg. Co., Inc., New York, N. Y.
● Fulton Sylphon Co., Knoxville, Tenn.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Sarcotherm Controls, Inc., Chicago, Ill.
Vapor Car Heating Co., Inc., Chicago, Ill.

## VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, PNEUMATIC

American Schaeffer & Budenburg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.

## VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, SELF-CONTAINED

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
American Schaeffer & Budenburg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
● Au-Temp-Co Corp., New York, N. Y.
Edison, Inc., Thos. A., Instrument Div., West Orange, N. J.
● Fulton Sylphon Co., Knoxville, Tenn.
Lawler Automatic Controls, Mount Vernon, N. Y.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
Tallmadge & Co., Webster, East Orange, N. J.
● Trane Co., The, LaCrosse, Wis.
Webster Tallmadge & Co., East Orange, N. J.

## VALVES, RADIATOR, ORIFICE

● American District Steam Co., North Tonawanda, N. Y.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
● Au-Temp-Co Corp., New York, N. Y.
Barnes & Jones, Inc., Boston, Mass.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
● Haines & Co., William S., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
New York Air Valve Corp., New York, N. Y.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
● Trane Co., The, LaCrosse, Wis.
● Webster & Co., Warren, Camden, N. J.

● Advertisement in this issue. See Index to Advertisers, page 350.

## VALVES, RADIATOR, STEAM AND HOT WATER, HAND

- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
- Belfield Co., H., Philadelphia, Pa.
- Belknap Mfg. Co., Bridgeport, Conn.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Burnham Boiler Corp., Irvington, N. Y.
- Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
- Chase Brass & Copper Co., Waterbury, Conn.
- ● Crane Co., Chicago, Ill.
- Detroit Brass & Malleable Wks., Detroit, Mich.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● Dunham Co., C. A., Chicago, Ill.
- Fairbanks Co., New York, N. Y.
- Gorton Heating Corp., Cranford, N. J.
- ● Grinnell Co., Inc., Providence, R. I.
- ● Haines & Co., William S., Philadelphia, Pa.
- Hammond Brass Wks., Hammond, Ind.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- ● Illinois Engineering Co., Chicago, Ill.
- Jarecki Mfg. Co., Erie, Pa.
- ● Jenkins Bros., New York, N. Y.
- ● Kennedy Valve Mfg. Co., Elmira, N. Y.
- Lunkenheimer Co., Cincinnati, O.
- Marsh Corp., Jas. P., Chicago, Ill.
- Marsh Valve Co., Dunkirk, N. Y.
- ● McAlear Mfg. Co., Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Northern Indiana Brass Co., Elkhart, Ind.
- Ohio Brass Co., Mansfield, O.
- Ohio Injector Co., Wadsworth, O.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- Powell Co., Wm., Cincinnati, O.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- ● Sarco Co., Inc., New York, N. Y.
- ● Schaible Co., The, Cincinnati, O.
- Scott Valve Mfg. Co., Detroit, Mich.
- ● Sterling, Inc., Milwaukee, Wis.
- ● Trane Co., The, LaCrosse, Wis.
- ● Walworth Co., New York, N. Y.
- ● Webster & Co., Warren, Camden, N. J.
- Williams Valve Co., D. T., Cincinnati, O.

## VALVES, RADIATOR, STEAM AND HOT WATER, MODULATING

- ● American District Steam Co., North Tonawanda, N. Y.
- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
- Barnes & Jones, Inc., Boston, Mass.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Cashin Co., W. D., Boston, Mass.
- ● Crane Co., Chicago, Ill.
- Cryer Trap & Valve Co., Inc., New York, N. Y.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● Dunham Co., C. A., Chicago, Ill.
- ● Fulton Sylphon Co., Knoxville, Tenn.
- Gorton Heating Corp., Cranford, N. J.
- ● Haines & Co., William S., Philadelphia, Pa.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- ● Illinois Engineering Co., Chicago, Ill.
- Marsh Corp., Jas. P., Chicago, Ill.
- Marsh Valve Co., Dunkirk, N. Y.
- ● McAlear Mfg. Co., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Ohio Brass Co., Mansfield, O.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- ● Sarco Co., Inc., New York, N. Y.
- Sarcotherm Controls, Inc., Chicago, Ill.
- Simplex Heating Specialty Co., Inc., Lynchburg, Va.
- ● Sterling, Inc., Milwaukee, Wis.
- Tallmadge & Co., Webster, East Orange, N. J.
- ● Trane Co., The, LaCrosse, Wis.
- Vapor Specialty Co., New York, N. Y.
- ● Webster & Co., Warren, Camden, N. J.
- Webster Tallmadge & Co., East Orange, N. J.

## VALVES, REFRIGERATION (ANGLE, CHECK, GATE, GLOBE, NEEDLE, RELIEF)

- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- Black-Sivalls & Bryson, Inc., Kansas City, Mo.
- Central Brass Mfg. Co., Cleveland, O.
- ● Crane Co., Chicago, Ill.
- Cyrus Shank Co., Chicago, Ill.
- Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
- ● Detroit Stamping Co., Detroit, Mich.
- ● Flori Pipe Co., The, St. Louis, Mo.
- Frick Co., Waynesboro, Pa.
- Henry Valve Co., Chicago, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Jenkins Bros., New York, N. Y.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Kunkle Valve Co., Ft. Wayne, Ind.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Lonergan Co., J. E., Philadelphia, Pa.
- Lunkenheimer Co., Cincinnati, O.
- ● Mueller Brass Co., Port Huron, Mich.
- Parker Appliance Co., The, Cleveland, O.
- Peerless of America, Inc., Marion, Ind.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- Reynolds Mfg. Co., Inc., Springfield, Mo.
- Shank Co., Cyrus, Chicago, Ill.
- Superior Valve and Fittings Co., Pittsburgh, Pa.
- Triumph Ice Machine Co., Cincinnati, O.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Weatherhead Co., Cleveland, O.
- Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- ● York Corp., York, Pa.

## VALVES, REFRIGERATION, BACK PRESSURE

- ● Alco Valve Co., St. Louis, Mo.
- Burrows Mfg. Co., F. A., York, Pa.
- ● Cash Co., A. W., Decatur, Ill.
- Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
- ● Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
- ● Fisher Governor Co., Marshalltown, Ia.
- Foster Engineering Co., Newark, N. J.
- Frigidaire Div., General Motors Corp., Dayton, O.
- Hubbell Corp., Chicago, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Lonergan Co., J. E., Philadelphia, Pa.
- ● Mueller Brass Co., Port Huron, Mich.
- Temprite Products Corp., Detroit, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- X L Refrigerating Co., Chicago, Ill.
- ● York Corp., York, Pa.

## VALVES, REFRIGERATION, EXPANSION, CONSTANT PRESSURE

- ● Alco Valve Co., St. Louis, Mo.
- ● Automatic Products Co., Milwaukee, Wis.
- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- ● Cash Co., A. W., Decatur, Ill.
- Consolidated Safety Valve Div., Manning, Maxwell & Moore Inc., Bridgeport, Conn.
- ● Detroit Lubricator Co., Detroit, Mich.
- Foster Engineering Co., Newark, N. J.
- Frigidaire Div., General Motors Corp., Dayton, O.
- Hubbell Corp., Chicago, Ill.
- Lonergan Co., J. E., Philadelphia, Pa.
- Mayson Mfg. Co., Inc., Detroit, Mich.
- Milwaukee Gas Specialty Co., Milwaukee, Wis.
- Peerless of America, Inc., Marion, Ind.
- Vilter Mfg. Co., Milwaukee, Wis.
- X L Refrigerating Co., Chicago, Ill.

## VALVES, REFRIGERATION, EXPANSION, THERMOSTATIC

- ● Alco Valve Co., St. Louis, Mo.
- ● Automatic Products Co., Milwaukee, Wis.
- ● Detroit Lubricator Co., Detroit, Mich.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● General Controls Co., Glendale, Calif.
- Mayson Mfg. Co., Inc., Detroit, Mich.
- Milwaukee Gas Specialty Co., Milwaukee, Wis.
- Peerless of America, Inc., Marion, Ind.
- Sporlan Valve Co., St. Louis, Mo.
- X L Refrigerating Co., Chicago, Ill.

## VALVES, REFRIGERATION, FLOAT, HIGH PRESSURE

- ● Alco Valve Co., St. Louis, Mo.
- American Injector Co., Detroit, Mich.
- Foster Engineering Co., Newark, N. J.
- Frick Co., Waynesboro, Pa.
- Hubbell Corp., Chicago, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- ● Mercoid Corp., Chicago, Ill.
- Phillips & Co., H. A., Chicago, Ill.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Temprite Products Corp., Detroit, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Voss Co., J. H. H., New York, N. Y.
- Weatherhead Co., Cleveland, O.
- Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- ● York Corp., York, Pa.

## VALVES, REFRIGERATION, MAGNETIC STOP

- ● Alco Valve Co., St. Louis, Mo.
- ● Automatic Products Co., Milwaukee, Wis.
- Automatic Switch Co., New York, N. Y.
- ● Detroit Lubricator Co., Detroit, Mich.
- Electric Valve Mfg. Co., Inc., New York, N. Y.
- ● Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
- Frick Co., Waynesboro, Pa.
- ● General Controls Co., Glendale, Calif.
- Hubbell Corp., Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.
- ● Penn Electric Switch Co., Goshen, Ind.

## VALVES, REFRIGERATION, WATER REGULATING, PRESSURE OR TEMPERATURE ACTUATED

- American Injector Co., Detroit, Mich.
- Art Valve Co., Chicago, Ill.
- ● Automatic Products Co., Milwaukee, Wis.
- ● Cash Co., A. W., Decatur, Ill.
- Cyrus Shank Co., Chicago, Ill.
- ● Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
- ● Fisher Governor Co., Marshalltown, Ia.

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Foster Engineering Co., Newark, N. J.
Frigidaire Div., General Motors Corp., Dayton, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Mercoid Corp., Chicago, Ill.
Mueller Co., Decatur, Ill.
● Penn Electric Switch Co., Goshen, Ind.
Perfection Refrigeration Parts Co., Harvey, Ill.
● Sarco Co., Inc., New York, N. Y.
Shank Co., Cyrus, Chicago, Ill.
Spence Engineering Co., Inc., Walden, N. Y.
Tagliabue Mfg. Co., Brooklyn, N. Y.

## VALVES, RELIEF, HOT WATER, COMBINED PRESSURE AND TEMPERATURE OPERATED

Beaton & Cadwell Mfg. Co., New Britain, Conn.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
● Crane Co., Chicago, Ill.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Kainer & Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Patrol Valve Co., The, Cleveland, O.
Spencer Thermostat Co., Attleboro, Mass.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Watts Regulator Co., Lawrence, Mass.

## VALVES, RELIEF, HOT WATER, PRESSURE OPERATED

Ashton Valve Co., Cambridge, Mass.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Boylston Steam Specialty Co., Chicago, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Crane Co., Chicago, Ill.
Davis Regulator Co., Chicago, Ill.
Eddy Valve Co., Waterford, N. Y.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Farris Engineering Co., Palisades Park, N. J.
● Fisher Governor Co., Marshalltown, Ia.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Kainer & Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Kunkle Valve Co., Ft. Wayne, Ind.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
● Maid-O'-Mist, Inc., Chicago, Ill.
● McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Neptune Meter Co., New York, N. Y.
Parker Appliance Co., The, Cleveland, O.
Patrol Valve Co., The, Cleveland, O.
Penberthy Injector Co., Detroit, Mich.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Schade Valve Mfg. Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Spencer Thermostat Co., Attleboro, Mass.
Staples & Pfeiffer, San Francisco, Calif.
● Swartwout Co., Cleveland, O.
Taco Heaters, Inc., New York, N. Y.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Tryco Products, Inc., Westfield, Mass.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

## VALVES, RELIEF, HOT WATER, PRESSURE OPERATED, SELF-FILLING

Beaton & Cadwell Mfg. Co., New Britain, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
● Crane Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Mueller Co., Decatur, Ill.
● Thrush & Co., H. A., Peru, Ind.
Watts Regulator Co., Lawrence, Mass.

## VALVES, RELIEF, OIL

Ashton Valve Co., Cambridge, Mass.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Fulflo Specialties Co., Inc., The, Blanchester, O.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kunkle Valve Co., Ft. Wayne, Ind.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y
Parker Appliance Co., The, Cleveland, O.
Watson & McDaniel Co., Philadelphia, Pa.

## VALVES, SADDLE

Fairbanks Co., New York, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
● Maid-O'-Mist, Inc., Chicago, Ill.
Ohio Injector Co., Wadsworth, O.
● Walworth Co., New York, N. Y.

## VALVES, SAFETY, STEAM

Ashton Valve Co., Cambridge, Mass.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Co., Detroit, Mich.
Consolidated Safety Valve Div., Manning, Maxwell & Mo Inc., Bridgeport, Conn.
● Crane Co., Chicago, Ill.
Farris Engineering Co., Palisades Park, N. J.
Foster Engineering Co., Newark, N. J.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kunkle Valve Co., Ft. Wayne, Ind.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
● McDonnell & Miller, Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
● Walworth Co., New York, N. Y.

## VALVES, SOLDER JOINT

● American Brass Co., Waterbury, Conn.
American Radiator & Standard Sanitary Corp., Pittsburgh, P
Chase Brass & Copper Co., Waterbury, Conn.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Fairbanks Co., New York, N. Y. (Silver braze joints)
Hammond Brass Works, Hammond, Ind.
Imperial-Brass Mfg. Co., Chicago, Ill.
● Jenkins Bros., New York, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Pittsburgh Valve & Fittings Corp., Barberton, O
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
● Walworth Co., New York, N. Y. (Brazed)
Weatherhead Co., Cleveland, O.
Williams Valve Co., D. T., Cincinnati, O.

## VALVES, SOLENOID

Albright Equipment Co., Johnstown, Pa.
● Alco Valve Co., St. Louis, Mo.
● Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
Automatic Switch Co., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Belfield Co., H., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
Cutler-Hammer, Inc., Milwaukee, Wis.
Davis Regulator Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Electric Valve Mfg. Co., Inc., New York, N. Y.
● Electrimatic Div., The, of the Simoniz Co., Chicago, Ill
Frick Co., Waynesboro, Pa.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
General Sales & Products Co., Cohoes, N. Y.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
Hubbell Corp., Chicago, Ill.
Hunt & Son, C. B., Salem, O.
Keckley Co., O. C., Chicago, Ill.
Lonergan Co., J. E., Philadelphia, Pa.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., Chicago, Ill.
Milwaukee Gas Specialty Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Min
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Parker Appliance Co., The, Cleveland, O.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
● Penn Electric Switch Co., Goshen, Ind.
Pfening Co., Fred D., Columbus, O. (1" water and steam)
R-S Products Corp., Philadelphia, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarco Co., Inc., New York, N. Y.
Sarcotherm Controls, Inc., Chicago, Ill.
Sporlan Valve Co., St. Louis, Mo.
Square D Co., Detroit, Mich.
Supreme Electric Products Corp., Rochester, N. Y.
Vapor Car Heating Co., Inc., Chicago, Ill.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.

## VALVES, 2, 3, AND 4 WAY

Albright Equipment Co., Johnstown, Pa.
● Alco Valve Co., St. Louis, Mo.
● American Brass Co., Waterbury, Conn.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
Belfield Co., H., Philadelphia, Pa.
Bordo Co., Inc., Glenside, Pa.
Bristol Co., Waterbury, Conn.

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● Cash Co, A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Davis Engineering Corp., Elizabeth, N. J.
Davis Regulator Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Fisher Governor Co., Marshalltown, Ia.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Hunt & Son, C. B., Salem, O.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Johnson Service Co., Milwaukee, Wis.
Kerotest Mfg. Co., Pittsburgh, Pa.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
● McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., Chicago, Ill.
Merco-Nordstrom Valve Co., Pittsburgh, Pa.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Mueller Brass Co., Port Huron, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Parker Appliance Co., Cleveland, O.
● Penn Electric Switch Co., Goshen, Ind.
Powell Co., Wm., Cincinnati, O.
● Powers Regulator Co., Chicago, Ill.
R-S Products Corp., Philadelphia, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
● Taylor Instrument Companies, Rochester, N. Y.
● Walworth Co., New York, N. Y. (Lubricated plug valves)
Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
Weatherhead Co., Cleveland, O.
Williams Valve Co., D. T., Cincinnati, O.

## VANES, DUCT TURNING, PREFABRICATED

Air Devices, Inc., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
● Tuttle & Bailey, Inc., New Britain, Conn.
Waterloo Register Co., Waterloo, Ia.

## VAPOR HEATING SYSTEMS

*See Systems, Heating, Vapor*

## VARIABLE SPEED DRIVES

*See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical; Reducers, Speed; Pulleys and Sheaves, for Belt Drives*

## VARIABLE SPEED PULLEYS

*See Changers, Speed, Mechanical*

## V-BELT DRIVES

*See Drives, V-Belt*

## VELOCITY REGULATORS

*See Regulators, Air Velocity*

## VENTILATION HEATERS

*See Surface, Finned, Heating*

## VENTILATORS, BLACKOUT

Air Conditioning Products Co., Detroit, Mich.
Carrier Corp., Syracuse, N. Y.
● Chelsea Fan & Blower Co., Inc., Irvington, N. J.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Jordan & Co., Inc., Paul R., Indianapolis, Ind.
● Young Radiator Co., Racine, Wis.

## VENTILATORS, MUSHROOM

Aeolus Dickinson, Chicago, Ill.
Best Register Co., Milwaukee, Wis.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Dickinson, Aeolus, Chicago, Ill.
Knowles Mushroom Ventilator Co., Montclair, N. J.
Lumm Co., A. H., Toledo, O.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
● Tuttle & Bailey, Inc., New Britain, Conn.
Ventilating Products Co., Chicago, Ill.

## VENTILATORS, ROOF, FAN

Aeolus Dickinson, Chicago, Ill.
Aerovent Fan Co., Piqua, O.
Air Conditioning Products Co., Detroit, Mich.
Air Controls, Inc., Cleveland, O.
Airmaster Corp., Chicago, Ill.
● Allen Corp., Detroit, Mich.
American Blower Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
American-Larson Ventilating Co., Pittsburgh, Pa.
American Steel Band Co., Pittsburgh, Pa.
Arex Co., Chicago, Ill.
Belanger Fan & Blower Co., Detroit, Mich.
Bishop & Babcock Mfg. Co., Cleveland, O.
Breidert Co., G. C., Los Angeles, Calif.
Burt Mfg. Co., Akron, O.
Century Fan & Ventilator Co., New York, N. Y.
● Chelsea Fan & Blower Co., Irvington, N. J.
Clay Equipment Corp., Cedar Falls, Ia.
Davidson Hy Duty Roof Fan Co., Newton, Mass.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Dickinson, Aeolus, Chicago, Ill.
Diehl Mfg. Co., Somerville, N. J.
Dual Air Fan Co., Chicago, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Fingles, Inc., W. A., Baltimore, Md.
Gallaher Co., The, Owatonna, Minn.
Gehri Co., Tacoma, Wash.
Grand Rapids Blow Pipe & Dust Arrester Corp., Grand Rapids Mich.
Hartzell Propeller Fan Co., Piqua, O.
Hirschman Co., W. F., Buffalo, N. Y.
Howes-Woods Co., Cambridge, Mass.
Hunter Fan & Ventilating Co., Inc., Memphis, Tenn.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Engineering, Inc., Dayton, O.
Iona Ventilator Co., Inc., Philadelphia, Pa.
Johnson Fan & Blower Corp., Chicago, Ill.
Jordan & Co., Paul R., Indianapolis, Ind.
Kernchen Co., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
Klauer Mfg. Co., Dubuque, Ia.
Klee Co., Geo. B., Cincinnati, O.
Lee & Son Co., Thomas, Cincinnati, O.
Lumm Co., A. H., Toledo, O.
Mellish & Murray Co., Chicago, Ill.
Mountain States Equipment Co., Denver, Colo.
Myers Electric Co., Inc., Pittsburgh, Pa.
National Metal Fabricators, Chicago, Ill.
● Nelson Corp., Herman, Moline, Ill.
New York Blower Co., Chicago, Ill.
● Peerless Electric Co., Warren, O.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
Phoenix Ventilator Co., Inc., Brooklyn, N. Y.
Powermatic Ventilator Co., Cleveland, O.
Propellair, Inc., Springfield, O.
Reed Unit-Fans, Inc., New Orleans, La.
Robertson Co., H. H., Pittsburgh, Pa.
Royal Ventilator Co., Philadelphia, Pa.
Schwitzer-Cummins Co., Indianapolis, Ind.
Shreveport Engineering Co., Inc., Shreveport, La.
Somers, Inc., H. J., Detroit, Mich.
● Sturtevant Co., B. F., Hyde Park, Boston, Mass.
● Swartwout Co., Cleveland, O.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
Truflo Fan Co., Harmony, Pa.
Uno Ventilator Co., Cliftondale, Mass.
Utility Appliance Corp., Los Angeles, Calif.
Van Noorden Co., E., Boston, Mass.
Viking Air Conditioning Corp., Cleveland, O.
Washburne & Co., E. G., New York, N. Y.
Waverly Heating Supply Co., Boston, Mass.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Wind-Way Fan & Ventilator Co., New Orleans, La.
● Wing Mfg. Co., L. J., New York, N. Y.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
● Young Radiator Co., Racine, Wis.

## VENTILATORS, ROOF, GRAVITY

A-J Mfg. Co., Kansas City, Mo.
Accurate Mfg. Works, Chicago, Ill.
Aeolus Dickinson, Chicago, Ill.
Air Control Products, Inc., Coopersville, Mich.
Air Devices, Inc., New York, N. Y.
● Allen Corp., Detroit, Mich.
American-Larson Ventilating Co., Pittsburgh, Pa.
American Metal Products Co., Fort Worth, Tex.
American Sheet Metal Works, New Orleans, La.
American Steel Band Co., Pittsburgh, Pa.
Ames Co., W. R., San Francisco, Calif.
Arex Co., Chicago, Ill.
Autoforce Ventilating System, Boston, Mass.
Berger Bros. Co., Philadelphia, Pa.
Breidert Co., G. C., Los Angeles, Calif.
Burt Mfg. Co., Akron, O.
Century Fan & Ventilating Co., New York, N. Y.
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Clay Equipment Corp., Cedar Falls, Ia.
Danzer Metal Works Co., Hagerstown, Md.
Day Co., The, Minneapolis, Minn.
Dickinson, Aeolus, Chicago, Ill.
Edwards Mfg. Co., Inc., Cincinnati, O.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Fingles, Inc., W. A., Baltimore, Md.
Gehri Co., Tacoma, Wash.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Hirschmann Co., W. F., Buffalo, N. Y.
Howes-Woods Co., Cambridge, Mass.
International Steel Co., Evansville, Ind.
Iona Ventilator Co., Inc., Philadelphia, Pa.
Iwan Brothers, South Bend, Ind.

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Jamar Co., Walker, Duluth, Minn.
Jordan & Co., Paul R., Indianapolis, Ind.
Kernchen Co., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
Klauer Mfg. Co., Dubuque, Ia.
Kleenaire Corp., Stevens Point, Wis.
La Crosse Steel Roofing & Corrugating Co., La Crosse, Wis.
Lamneck Products, Inc., Middletown, O.
Lee & Son Co., Thomas, Cincinnati, O.
Leslie Welding Co., Chicago, Ill.
Levow, David, New York, N. Y.
Lumm Co., A. H., Toledo, O.
Lyon, Conklin & Co., Inc., Baltimore, Md.
Mellish & Murray Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Milcor Steel Co., Milwaukee, Wis.
Moeschl-Edwards Corrugating Co., Inc., Cincinnati, O.
Osborn Co., The, J. M. & L. A., Cleveland, O.
Patten Co., J. V., Sycamore, Ill.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
Phoenix Ventilator Co., Inc., Brooklyn, N. Y.
Pioneer Roofing & Sheet Metal Co., Muskogee, Okla.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Riggin Metal Products, Inc., Kankakee, Ill.
Robertson Co., H. H., Pittsburgh, Pa.
Royal Ventilator Co., Philadelphia, Pa.
Ryniker Steel Products Co., Billings, Mont.
St. Paul Corrugating Co., St. Paul, Minn.
Sheet Metal Mfg. Co., Inc., Brooklyn, N. Y.
Sioux Steel Co., Sioux Falls, S. D.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Souther Iron Co., E. E., St. Louis, Mo.
Southern States Iron Roofing Co., Savannah, Ga.
Standard Furnace & Supply Co., Omaha, Neb.
Standard Ventilator Co., Lewisburg, Pa.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
● Swartwout Co., Cleveland, O.
Tierney Rotor Ventilator Co., Minneapolis, Minn.
Tiffin Eaves Trough Co., Tiffin, O.
Uno Ventilator Co., Cliftondale, Mass.
Van Noorden Co., E., Boston, Mass.
Walker Jamar Co., Duluth, Minn.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Willis Steel Corp., Galesburg, Ill.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
York Corrugating Co., York, Pa.

### VENTILATORS, UNIT

● Airtherm Mfg. Co., St. Louis, Mo.
Johnson Fan & Blower Corp., Chicago, Ill.
● Nelson Corp., Herman, Moline, Ill.
● Nesbitt, Inc., John J., Philadelphia, Pa.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
● Sturtevant Co., B. F., Boston, Mass.
● Trane Co., The, La Crosse, Wis.

### VIBRATION ABSORBERS

*See Absorbers, Vibration*

### VIBRATION ELIMINATORS

*See Absorbers, Vibration; Bases and Pads, Vibration Isolating; Hose, Metal and Fittings*

### VIBRATION ISOLATORS

*See Absorbers, Vibration; Bases and Pads, Vibration Isolating; Hose, Metal and Fittings*

### VISCOSIMETERS

American Instrument Co., Silver Spring, Md.
Brabender Corp., Rochelle Park, N. J.
Brookfield Engineering Laboratories, Sharon, Mass.
Daigger & Co., A., Chicago, Ill.
Eimer & Amend, New York, N. Y.
Fish-Schurman Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Greiner Co., Emil, New York, N. Y.
Humboldt Mfg. Co., Chicago, Ill.
Machlett & Son, E., New York, N. Y.
Olsen Testing Machine Co., Tinius, Philadelphia, Pa.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Precision Scientific Co., Chicago, Ill.
Ruehfel Co., Inc., George, Brooklyn, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Thermal Syndicate, Ltd., The, New York, N. Y.
Thomas Co., Arthur H., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Will Corp., Rochester, N. Y.

### VISCOUS LIQUID PUMPS

*See Pumps, Viscous Liquids*

### VISES, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O. (Sawing—for tubing)
Billings & Spencer Co., Hartford, Conn.
Crown Die & Tool Co., Chicago, Ill.
Desmond-Stephen Mfg. Co., Urbana, O.
Erie Tool Wks., Erie, Pa.
Hollands Mfg. Co., Erie, Pa.
International Nutyp Tool Co., Oswego, N. Y.
Jarecki Mfg. Co., Erie, Pa.
Nye Tool & Machine Co., Chicago, Ill.
Reimuller Bros. Co., Franklin Park, Ill.
● Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.
Trimont Mfg. Co., Roxbury, Mass.
Vanderman Mfg. Co., Willimantic, Conn.
Williams & Co., J. H., Buffalo, N. Y.
Yost Mfg. Co., Meadville, Pa.

### VISE STANDS

*See Stands, Pipe Vise*

### WALL THERMOSTATS

*See Thermostats, Room or Wall*

### WARM AIR FURNACES

*See Furnaces, Warm Air*

### WASHERS, AIR

● Air & Refrigeration Corp., New York, N. Y.
Airwasher Corp., Lansing, Mich.
American Blower Corp., Detroit, Mich.
Ames Co., W. R., San Francisco, Calif.
Ballantyne Co., Omaha, Neb.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Centri-Spray Co., Detroit, Mich.
● Clarage Fan Co., Kalamazoo, Mich.
Columbus Heating & Ventilating Co., Columbus, O.
Drying Systems, Inc., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
International Sales Co., San Francisco, Calif.
Mellish & Murray Co., Chicago, Ill.
Mountain States Equipment Co., Denver, Colo.
● Murray Mfg. Co., D. J., Wausau, Wis.
New York Blower Co., Chicago, Ill.
Northern Blower Co., Cleveland, O.
Parks-Cramer Co., Fitchburg, Mass.
Peters-Dalton, Inc., Detroit, Mich.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Ross Sprinkler Co., Pasadena, Calif.
Schmieg Industries, Detroit, Mich.
Spray Engineering Co., Somerville, Mass.
Strandwitz & Co., Inc., W. J., Camden, N. J.
● Sturtevant Co., B. F., Boston, Mass.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Vilter Mfg. Co., Milwaukee, Wis.
Western Blower Co., Seattle, Wash.
● York Corp., York, Pa.

### WATER CHILLERS

*See Chillers, Water, for Air Conditioning and Refrigeration*

### WATER HEATERS

*See Heaters, Indirect, Submerged; Heaters, Water*

### WATER METERS

*See Meters, Water*

### WATER TREATMENT

*See Treatment, Water, to Inhibit Corrosion*

### WATER VAPOR REFRIGERATION

*See Compressors, Refrigerating, Centrifugal; and Compressors, Refrigerating, Steam Jet*

### WELD TESTING MACHINES

*See Machines, Testing, Weld*

### WELDERS, ARC

● Air Reduction Sales Co., New York, N. Y.
Allied Weld-Craft, Inc., Indianapolis, Ind.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Borm Mfg. Co., Elgin, Ill.
Coddington Mfg. Co., E. D., Milwaukee, Wis.
Commonwealth Electric Welder Mfg. Co., Philadelphia, Pa.
Eisler Engineering Corp., Newark, N. J.
Electric Arc, Inc., Newark, N. J.
Ergolyte Mfg. Co., Philadelphia, Pa.
Fern, Ralph, Scranton, Pa.
General Electric Co., Schenectady, N. Y.
General Equipment Co., Wichita, Kans.
Hammett Electric Mfg. Co., Kansas City, Mo.
Hampton Electric Mfg. Co., Pittsburgh, Pa.
Harnischfeger Corp., Milwaukee, Wis.
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
Hobart Bros. Co., Troy, O.
Hollup Corp., Div. of National Cylinder Gas Co., Chicago, Ill.
Ideal Electric & Mfg. Co., Mansfield, O.
Lee Co., K. O., Aberdeen, S. D.
Lincoln Electric Co., Cleveland, O.
Maple Valley Mfg. Co., Mapleton, Ia.
Marquette Mfg. Co., Minneapolis, Minn.
Mid-States Equipment Co., Chicago, Ill.
Miller Electric Mfg. Co., Inc., Appleton, Wis.
National Cylinder Gas Co., Chicago, Ill.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Sight Feed Generator Co., Richmond, Ind.
Smith Welding Equipment Corp., Minneapolis, Minn.
● Star Electric Motor Co., Bloomfield, N. J.
Trindl Products, Ltd., Chicago, Ill.
Una Welding, Inc., Cleveland, O. (Automatic shielded arc welding)
Universal Power Corp., Cleveland, O.

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Welding Apparatus Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Will-Weld Mfg. Co., Inc., Omaha, Neb.
Wilson Welder & Metals Co., Inc., New York, N. Y.

## WELDERS, SPOT

Acme Electric Welder Co., Los Angeles, Calif.
Agnew Electric Co., Milford, Mich.
Alphil Spot Welding Co., New York, N. Y.
Coddington Mfg. Co., E. D., Milwaukee, Wis.
Dyer Welder & Engineering Co., Kansas City, Mo.
Eisler Engineering Corp., Newark, N. J.
Electric Arc, Inc., Newark, N. J.
Federal Machine & Welder Co., Warren, O.
Micro Products Co., Chicago, Ill.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Sciaky Bros., Chicago, Ill.
Taylor-Hall Welding Corp., Worcester, Mass.
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Universal Power Corp., Cleveland, O.
Weldex, Inc., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## WELDERS, STUD

Hollup Corp., Div. of National Cylinder Gas Co., Chicago, Ill.
● Nelson Specialty Welding Equipment Corp., San Leandro, Calif.

## WELDING COMPOUNDS

*See Compounds, Welding*

## WELDING AND CUTTING APPARATUS, OXY-ACETYLENE

● Air Reduction Sales Co., New York, N. Y.
Allied Weld-Craft, Inc., Indianapolis, Ind.
Allison Tool & Engineering Co., Los Angeles, Calif.
Atlas Welding Accessories Co., Detroit, Mich. (weld cleaning tools)
Dockson Corp., Detroit, Mich.
Ergolyte Mfg. Co., Philadelphia, Pa.
Galv-Weld Products, Dayton, O. (regalvanizing process)
Harris Calorific Co., The, Cleveland, O.
Imperial Brass Mfg. Co., Chicago, Ill.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Marquette Mfg. Co., Minneapolis, Minn.
Milburn Co., Alexander, Baltimore, Md.
Modern Engineering Co., St. Louis, Mo.
National Cylinder Gas Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
QuicKwork Div., Whiting Corp., Harvey, Ill. (Welding positioner)
Ransome Machinery Co., Sub. of Worthington Pump & Machinery Corp., Dunellen, N. J. (Welding positioner)
Smith Welding Equipment Corp., Minneapolis, Minn.
Tempil Corp., New York, N. Y. (Temperature indicators)
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Tru-Line Corp., Los Angeles, Calif. (Protractor for marking pipe)
Universal Power Corp., Cleveland, O.
Victor Equipment Co., San Francisco, Calif.
Wall Chemicals Div. of The Liquid Carbonic Corp., Chicago, Ill.

## WELDING FUME COLLECTORS

*See Exhausters, Welding Fume*

## WELDING PIPE CLAMPS

*See Clamps, Pipe, Welding*

## WELDING RINGS

*See Rings, Welding*

## WELDING ROD

*See Rod, Gas Welding*

## WHEELS, BLOWER

Advance Aluminum Castings Corp., Chicago, Ill.
Air Controls, Inc., Cleveland, O.
Bayley Blower Co., Milwaukee, Wis.
Beckett & Co., Thomas, Dallas, Tex.
Bishop & Babcock Mfg. Co., Cleveland, O.
Champion Blower & Forge Co., Lancaster, Pa.
● Clarage Fan Co., Kalamazoo, Mich.
Economy Electric Mfg. Co., Chicago, Ill.
Goettl Bros. Metal Prod. Co., Phoenix, Ariz.
Hastings Air Conditioning Co., Hastings, Neb.
Jaden Mfg. Co., Hastings, Neb.
● Janette Mfg. Co., Chicago, Ill.
● Lau Blower Co., Dayton, O.
Morrison Products, Inc., Cleveland, O.
New York Blower Co., Chicago, Ill.
● Peerless Electric Co., Warren, O.
Schwitzer-Cummins Co., Indianapolis, Ind.
● Sturtevant Co., B. F., Boston, Mass.
Torrington Mfg. Co., Torrington, Conn.
● Trane Co., The, LaCrosse, Wis.
Triangle Mfg. Co., Oshkosh, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Appliance Corp., Los Angeles, Calif.
Viking Air Conditioning Corp., Cleveland, O.
Western Blower Co., Seattle, Wash.

## WHITE PRINT MACHINES

*See Machines, Blue Print and White Print*

## WINDOW VENTILATOR AND FILTER UNITS

*See Units, Window Ventilator and Filter*

## WINDOWS, HEAT INSULATING

Advance Insulating Co., Pittsburgh, Pa.
Andersen Corp., Bayport, Minn.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Detroit Steel Products Co., Detroit, Mich.
Kane Mfg. Corp., Kane, Pa.
Libbey-Owens Ford Glass Co., Toledo, O.
Mississippi Glass Co., New York, N. Y.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Russell Co., F. C., Cleveland, O.
Truscon Steel Co., Youngstown, O.

## WOOD PIPE

*See Pipe, Wood*

## WRENCHES, ADJUSTABLE

Billings & Spencer Co., Hartford, Conn.
● Bonney Forge & Tool Works, Allentown, Pa.
Crescent Tool Co., Jamestown, N. Y.
Erie Tool Works, Erie, Pa.
Peck, Stow & Wilcox Co., Southington, Conn.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Techtmann Industries, Inc., Milwaukee, Wis.
Trimont Mfg. Co., Boston, Mass.
Williams & Co., J. H., Buffalo, N. Y.

## WRENCHES, OPEN END

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Techtmann Industries, Inc., Milwaukee, Wis.
Williams & Co., J. H., Buffalo, N. Y.

## WRENCHES, PIPE

Armstrong Bros. Tool Co., Chicago, Ill.
Bernz Co., Inc., Otto, Rochester, N. Y.
Billings & Spencer Co., Hartford, Conn.
● Bonney Forge & Tool Works, Allentown, Pa.
Erie Tool Works, Erie, Pa.
International Nutyp Tool Co., Oswego, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
● Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Trimont Mfg. Co., Boston, Mass.
USHCO Mfg. Co., Inc., Buffalo, N. Y.
● Walworth Co., New York, N. Y.

## WRENCHES, RATCHET

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Greene, Tweed & Co., New York, N. Y.
Lowell Wrench Co., Worcester, Mass.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Williams & Co., J. H., Buffalo, N. Y.

## WRENCHES, SOCKET

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Chicago Pneumatic Tool Co., New York, N. Y. (pneumatic)
Lowell Wrench Co., Worcester, Mass.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Williams & Co., J. H., Buffalo, N. Y.

## WRENCHES, TORQUE INDICATING

Automotive Maintenance Machinery Co., North Chicago, Ill.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Sturtevant Co., P. A., Addison, Ill.
Williams & Co., J. H., Buffalo, N. Y.

## WROUGHT IRON PIPE

*See Pipe, Wrought Iron*

## WROUGHT IRON SHEETS

*See Sheets, Wrought Iron*

## X-RAY MACHINES AND FILM

*See Machines and Film, X-Ray*

## ZINC SHEETS

*See Sheets, Zinc*

## ZONE CONTROLS

*See Systems, Heating, Zone Control*

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# DIRECTORY SECTION

## HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

# PART 2—TRADE NAMES

**A-B**—Motor controllers. Allen-Bradley Co., Milwaukee, Wis.

**ABC**—Humidifiers. American Blower Corp., Detroit, Mich.

**AGP**—Heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**A-P**—Damper operators, regulators, thermostats, valves. Automatic Products Co., Milwaukee, Wis.

**A.P.S. Plasteel**—Metal sheets. Protected Steel Products Co., Washington, Pa.

**A.R.A.**—Non-metallic sheets and board. Wilson, Inc., Grant, Chicago, Ill.

**ARRC** — Couplings, fittings, flanges, unions. Union Metal Wks., Chelsea, Mass.

**ASBO** — Ventilators. American Steel Band Co., Pittsburgh, Pa.

**A & T Teksag**—Boiler cleaning compounds. Agnew & Tomlinson, New York, N. Y.

**Abrasoweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Absorbex** — Insulation. Celotex Corp., The, Chicago, Ill.

**Acco-Lastic**—Caulking compounds. Accurate Metal Weather Strip Co., Inc., New York, N. Y.

**Ace**—Pipe, pipe and fittings, tanks, valves, pumps. American Hard Rubber Co., New York, N. Y.

**Ace**—Steam traps. Connor Engineering Corp., W. B., New York, N. Y.

**Ace**—Welders. Pier Equipment Mfg. Co., Benton Harbor, Mich.

**Acidseal**—Protective coatings. Goodrich Co., B. F., Akron, O.

**Acme** — Boilers. Titusville Iron Wks. Co., Titusville, Pa.

**Acotite**—Enamels and lacquers. Acorn Refining Co., Cleveland, O.

**Acousteel** — Insulation. Celotex Corp., The, Chicago, Ill.

**Acousti-Celotex** — Insulation. Celotex Corp., The, Chicago, Ill.

**Acoustilite** — Insulation. Insulite Co., Minneapolis, Minn.

**Acoustone** — Insulation. United States Gypsum Co., Chicago, Ill.

**Acratherm**—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Adamant**—Fire brick cement. Botfield Refractories Co., Philadelphia, Pa.

**Ada-Stic**—Insulating cement. Botfield Refractories Co., Philadelphia, Pa.

**Adjustiblade** — Registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Adjusto**—Packing. Keasbey & Mattison Co., Ambler, Pa.

**Adjust-O-Feeder** — Feeders, pumps, steam system and water treatment. % Proportioneers, Inc. %. Providence, R. I.

**Adjustor** — Heating systems. Kehm Corp., The, Chicago, Ill.

**Adsco** — Coils, heaters, joints, meters, pipe, pipe hangers and supports, pipe protectors, separators, strainers, regulators, valves. American District Steam Co., North Tonawanda, N. Y.

**Adsco-Bannon**—Conduit. American District Steam Co., North Tonawanda, N. Y.

**Adsco Rotary**—Condensation meters. American District Steam Co., North Tonawanda, N. Y.

**Adsco Vertical**—Traps. American District Steam Co., North Tonawanda, N. Y.

**Aeracool**—Blades, fans, louvers and shutters, ventilators. Myers Electric Co., Inc., Pittsburgh, Pa.

**Aerate**—Ventilators. Aeolus Dickinson, Chicago, Ill.

**Aerisweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Aer-Nu**—Air fresheners. Lundy Co., E. A., New York, N. Y.

**Aero**—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

**Aero-Art**—Radiation. National Radiator Co., The, Johnstown, Pa.

**Aerocrat**—Fans, washers. Ames Co., W. R., San Francisco, Calif.

**Aerodyne**—Fans. Jeffrey Mfg. Co., Columbus, O.

**Aerofuse** — Air diffusers. Tuttle & Bailey, Inc., New Britain, Conn.

**Aeroplane**—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

**Aeroplex**—Fans. Bayley Blower Co., Milwaukee, Wis.

**Aeropull**—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

**Aero Seal**—Packing. Chicago Belting Co., Chicago, Ill.

**Aerospot**—Fans. South Bend Air Products Corp., South Bend, Ind.

**Aerovalve**—Ventilators. Knowles Mushroom Ventilator Co., Montclair, N. J.

**Afco**—Fans, furnaces, heaters. American Furnace Co., St. Louis, Mo.

**Affco** — Grilles, hangers, louvers and shutters. American Foundry & Furnace Co., Bloomington, Ill.

**Agile**—Welding electrodes. American Agile Corp., Cleveland, O.

**Agitair**—Air diffusers, grilles, heaters, vanes. Air Devices, Inc., New York, N. Y.

**Air Control**—Fans; heaters, unit air conditioners. Hastings Air Conditioning Co., Hastings, Neb.

**Air Lader**—Air diffusers, louvers and shutters. Guth Co Edwin F., St. Louis, Mo

**Air Stone**—Conduit Dockstader, S. E., Washington, D. C.

**Air-Van** — Ventilators. The Gallaher Co., Owatonna, Minn.

**Air Vane** — Grilles, registers. Rock Island Register Co., Rock Island, Ill.

**Airacoustic** — Insulation. Johns-Manville, New York, N. Y.

**Air-A-Way** — Ventilators. American Metal Products Co., Fort Worth, Tex.

**Airco**—Welding rod, solder, pipe cutting machines. Air Reduction Sales Co., New York, N. Y.

**Air-Con**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Airefiner** — Water treatment. Oakite Products, Inc., New York, N. Y.

**Airex**—Air washers, fans, unit air conditioners, ventilators. Mountain States Equipment Co., Denver, Colo.

**Air-Fan**—Window ventilator units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

**Air-Flo**—Dampers, louvers and shutters. Belanger Fan & Blower Co., Detroit, Mich.

**Air-flo**—Dampers, louvers and shutters. Air Conditioning Products Co., Detroit, Mich.

**Air-flo**—Ventilators. Aeolus Dickinson, Chicago, Ill.

**Air Flow**—Fans. Goettl Bros. Metal Prod. Co., Phoenix, Ariz.

**Airfoil**—Fans, fan blades, ventilators. Aerovent Fan Co., Piqua, O.

**Airguide**—Hygrometers, thermometers. Fee and Stemwedel, Inc., Chicago, Ill.

**Airheater** — Unit heaters. Airtherm Mfg. Co., St. Louis, Mo.

**Airid**—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Airistocrat** — Fan blades. Torrington Mfg. Co., Torrington, Conn.

**Airkem**—Air freshening compound. W H. Wheeler, Inc., New York, N. Y.

**Airline**—Grilles, registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Airlok** — Insulation. Plastegon Wall Board Co., Buffalo, N. Y.

**Airmat Arrester** — Dust collectors. American Air Filter Co., Inc., Louisville, Ky.

**Airmixt** — Gas and oil burners. Williams, Inc., F. C., Dearborn, Mich.

**Airo-Flex** — Registers. Auer Register Co., Cleveland, O.

**Airocool** — Burners. National Airoil Burner Co., Inc., Philadelphia, Pa.

**Airoil**—Cleaning compounds, oil burners. National Airoil Burner Co., Inc., Philadelphia, Pa.

**Air-o-Line** — Indicator-controllers, recorder-controllers. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

**Air-O-Matic** — Refrigerating machines. Williams Oil-O-Matic Corp., Bloomington, Ill.

**Airotherm**—Zone control thermostat. Tallmadge & Co., Webster, East Orange, N. J.

**Airotor** — Blower wheels. Torrington Mfg. Co., Torrington, Conn.

**Airout** — Ventilators. Western Engineering & Mfg. Co., Los Angeles, Calif.

**Airovent**—Gas burners. National Airoil Burner Co., Inc., Philadelphia, Pa.

**Airridge**—Ventilators. Aeolus Dickinson, Chicago, Ill.

**Airstat** — Regulators. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Airstream**—Air filters. Brauer Supply Co., A. G., St. Louis, Mo.

**Airstream**—Blower wheels. Morrison Products, Inc., Cleveland, O.

**Airswitch**—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Airtrol**—Fans. Air Control Products Inc., Coopersville, Mich.

**Air-Vent**—Fans. Airtherm Mfg. Co. St. Louis, Mo.

**Air-X-Hausters** — Roof ventilators. Breidert Co., G. C., Los Angeles, Calif.

**Airxpel**—Steam traps. Wright-Austin Co., Detroit, Mich.

**Ajax**—Ducts, fittings, ventilators. Cincinnati Sheet Metal & Roofing Co. Cincinnati, O.

**Ajax**—Gaskets. United States Gasket Co., Camden, N. J.

**Akon** — Water treatment. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Alco**—Ventilators. Lumm Co., A. H., Toledo, O.

**Alcoa** — Angles, electrodes, sheets, tanks, tubing. Aluminum Co. of America, Pittsburgh, Pa.

**Alkalex** — Water treatment. Research Products Corp., Madison, Wis.

**All-Vac** — Vacuum heating systems. Lonn Mfg. Co., Inc., Chicago, Ill.

**Alnor**—Thermometers. Illinois Testing Laboratories, Chicago, Ill.

**Alorco**—Dehydrators. Aluminum Co. of America, Pittsburgh, Pa.

**Aloyco**—Stainless steel fittings, nipples, pipe, tubing, unions, valves. Alloy Steel Products Co., Linden, N. J.

**Alternarc**—Arc welders. Electric Arc, Inc., Newark, N. J.

**Alumaweld**—Solder and fluxes. Johnson Co., Lloyd S., Chicago, Ill.

**Aluminweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Always Reliable** — Benders, cutters, leak detectors, torches, wrenches. Bernz Co., Inc., Otto, Rochester, N. Y.

**Ambler**—Cement. Keasbey & Mattison Co., Ambler, Pa.

**Amco**—Galvanizing powder. American Solder & Flux Co., Philadelphia, Pa.

**Amco**—Humidifiers, humidistats, hygrometers. American Moistening Co., Providence, R. I.

**Amco**—Packing. Austin-Mason Co., New York, N. Y.

**Amerform**—Plastic pipe and fittings, refractories. Commonwealth Products Co., Philadelphia, Pa.

**American**—Couplings. American Flexible Coupling Co., Erie, Pa.

**American**—Furnaces, heaters. American Foundry & Furnace Co., Bloomington, Ill.

**American** — Gages, recorders, regulators, thermometers, valves. American-Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

**American** — Meters. American Meter Co., Inc., New York, N. Y.

**American**—Speed reducers. American Pulley Co., Philadelphia, Pa.

**American** — Steel sheets. American Steel & Wire Co., Cleveland, O.

**American** — Vibration eliminators. American Metal Hose Branch, American Brass Co., Waterbury, Conn.

**American** — Pumps, water treatment. American Well Works, Aurora, Ill.

**American**—Pipe benders. American Pipe Bending Machine Co., Inc., Boston, Mass.

**American** — Water heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Ames** — Pumps. Domestic Engine & Pump Co., Shippensburg, Pa.

**Aminco** — Dehydrant, dehydrators, valves. American Injector Co., Detroit, Mich.

**Amirglass**—Filters. Amirton Co., New York, N. Y.

**Ammco**—Wrenches. Automotive Maintenance Machinery Co., North Chicago, Ill.

**Ammonoduct** — Pipe. Bethlehem Steel Co., Bethlehem, Pa.

**Ampac** — Arc welders. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Ampco** — Dust collectors. American Metal Products Co., Fort Worth, Tex.

**Anaconda**—Fittings, pipe, welding rod, sheets, solder, tubing, valves. American Brass Co., Waterbury, Conn.

**Anemo-light** — Air diffusers. Anemostat Corp. of America, New York, N. Y.

**Anemo-trol**—Air diffusers. Anemostat Corp. of America, New York, N. Y.

**Ankorite**—Packing. Anchor Packing Co., Philadelphia, Pa.

**Anti-Sweat** — Insulation. Johns-Manville, New York, N. Y.

**A-Pe-Co**—Blueprint machines. American Photocopy Equipment Co., Chicago, Ill.

**Apex**—Recorders. Uehling Instrument Co., Paterson, N. J.

**Apex**—Regulators. Ohio Products Co., Cleveland, O.

**Apexior** — Coatings. Dampney Co. of America, Boston, Mass.

**Aqua-Clear** — Water treatment. Sudbury Laboratory, South Sudbury, Mass.

**Aqualator**—Circulators. Triplex Mfg. Co., Peru, Ind.

**Aqua-Master**—Water heaters. Century Engineering Corp., Cedar Rapids, Ia.

**Aquaseal** — Cement and compounds. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Aquatrol** — Boiler cleaning compounds and water treatment. Aquatic Chemical Laboratories, Inc., New York, N. Y.

**Aqulux**—Heaters. Johnson Co., S. T. Oakland, Calif.

**Arc-Eng**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Arco** — Hangers, plates, radiation, valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Arctic Circle**—Air conditioning units. Goettl Bros. Metal Prod. Co., Phoenix, Ariz.

**Arex-Austor**—Roof ventilators. Arex Co., Chicago, Ill.

**Aridifier**—Separators. Logan Engineering Co., Chicago, Ill.

**Arin**—Louvers and shutters. Arex Co., Chicago, Ill.

**Aristocrat**—Registers. Auer Register Co., Cleveland, O.

**Armco**—Pipe, sheets. American Rolling Mill Co., The, Middletown, O.

**Armorak** — Insulation. Keasbey Co., Robert A., New York, N. Y.

**Arrowtrol**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Artic**—Refrigerators. du Pont de Nemours & Co., E. I., Electrochemicals Dept., Wilmington, Del.

**Asbestocel** — Insulation. Johns-Manville, New York, N. Y.

**Asco**—Valves, relays, switches. Automatic Switch Co., New York, N. Y.

**At-a-Glance**—Gages. Krueger Sentry Gauge Co., Green Bay, Wis.

**Athol** — Pipe fittings, unions. Leavitt Machine Co., Orange, Mass.

**Atlas** — Unions. Rockwood Sprinkler Co., Worcester, Mass.

**Atticvane**—Fans. Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**Autocrat**—Fan blades. Torrington Mfg. Co., Torrington, Conn.

**Auto-Klean**—Filters, strainers. Cuno Engineering Corp., Meriden, Conn.

**Automatic** — Tube cleaners. Albright Equipment Co., Johnstown, Pa.

**Auto-Tite** — Pipe couplings. Superior Railway Products Corp., Pittsburgh, Pa.

**Autovent** — Eliminators, humidifiers, valves. Maid-O'-Mist, Inc., Chicago, Ill.

**Autozone** — Zone control unit. Tallmadge & Co., Webster, East Orange, N. J.

**Axiflo**—Propeller fans. Sturtevant Co., B. F., Boston, Mass.

**Axiom**—Filters. Blocksom & Co., Michigan City, Ind.

**B. B.**—Blast gates, valves. Berger Bros. Co., Philadelphia, Pa.

**B. B.**—Electric motors. Brown-Brockmeyer Co., Dayton, O.

**B & B**—Heating and air conditioning equipment. Bishop & Babcock Mfg. Co., Cleveland, O.

**BCA**—Bearings. Bearings Co. of America, Lancaster, Pa.

**B & C**—Plates. Beaton & Corbin Mfg. Co., Southington, Conn.

**B. & G.**—Air eliminators, circulators, condensers, coolers, fittings, hangers, heat exchangers, heaters, regulators, tanks, thermostats, valves. Bell & Gossett Co., Morton Grove, Ill.

**B & K**—Pipe cutting and threading machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

**B & W**—Boilers, burners, desuperheaters, fuel economizers, heat exchangers, process tanks, refractories, stokers, valves. Babcock & Wilcox Co., New York, N. Y.

**Bacite**—Insulation. Bird-Archer Co., Philadelphia, Pa.

**Baco**—Cleaning compounds, refractories. Bird-Archer Co., Philadelphia, Pa.

**Badger**—Filters. Air Devices, Inc., New York, N. Y.

**Badger**—Time switches. Reliance Automatic Lighting Co., Racine, Wis.

**Balancer**—Heating systems. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

**Balsam-Wool**—Insulation. Wood Conversion Co., St. Paul, Minn.

**Bankheat**—Oil burners. Johnson Co., S. T., Oakland, Calif.

**Bar-Brook**—Unit air conditioners, fans, heaters, ventilators. Shreveport Engineering Co., Inc., Shreveport, La.

**Barcol** — Humidistats, motors, operators, regulators, thermostats, valves. Barber-Colman Co., Rockford, Ill.

**Barlastic**—Caulking compounds. Barland Weatherstrip Material Co., Cleveland, O.

**Barnes** — Cutters. Erie Tool Works, Erie, Pa.

**Barry**—Bearings, pulleys and sheaves. Dick Co., Inc., R. & J., Passaic, N. J.

**Barton-American**—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

**Basmor**—Boilers. Bastian-Morley Co., Inc., La Porte, Ind.

**Battery**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Beacor**—Valves. Beaton & Corbin Mfg. Co., Southington, Conn.

**Beauticast**—Radiation. Columbia Radiator Co., McKeesport, Pa.

**Beaverkill**—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

**Bell**—Cement. Keasbey & Mattison Co., Ambler, Pa.

**Benco** — Oil burners. Bennett Co., Omaha, Neb.

**Benda Vane** — Grilles. Rock Island Register Co., Rock Island, Ill.

**Bend-Ezy**—Grilles, registers. Standard Stamping & Perforating Co., Chicago, Ill.

**Bendmaster**—Tubing benders. Leonard Precision Products Co., Garden Grove, Calif.

**Benton**—Boilers. Combination Boiler Co., Benton Harbor, Mich.

**Berloy**—Steel sheets. Berger Mfg. Div., Republic Steel Corp., Canton, O.

**Bestfelt**—Insulation. Keasbey & Mattison Co., Ambler, Pa.

**Beth-Co-Weld**—Pipe. Bethlehem Steel Co., Bethlehem, Pa.

**Beth-Cu-Loy**—Sheets. Bethlehem Steel Co., Bethlehem, Pa.

**Bi-Air**—Burners. John Zink Co., Tulsa, Okla.

**Bifurcator** — Fans. DeBothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.

**Big Midget**—Soot blowers. Sturtevant Co., B. F., Boston, Mass.

**Bildrite** — Insulation. Insulite Co., Minneapolis, Minn.

**Bi-Mix**—Burners. John Zinc Co., Tulsa, Okla.

**Binoc**—Thermometers. Taylor Instrument Companies, Rochester, N. Y.

**Birm** — Water treatment. Research Products Corp., Madison, Wis.

**Bison**—Boilers. Farrar & Trefts, Buffalo, N. Y.

**Bitumastic**—Protective coatings. Wailes Dove-Hermiston Corp., Westfield, N. J.

**Bloapco**—Dust collectors. Blower Application Co., Milwaukee, Wis.

**Blowertrol** — Speed changers. White Mfg. Co., St. Paul, Minn.

**Blue-Point** — Drills, tools, wrenches. Snap-On Tools Corp., Kenosha, Wis.

**Blue Ribbon** — Hangers or brackets, nipples, plates. Chicago Nipple Mfg. Co., Chicago, Ill.

**Blue Streak**—Blueprint machines. Paragon-Revolute Corp., Rochester, N. Y.

**Boardman** — Pump governors. Locke Regulator Co., Salem, Mass.

**Branford**—Oil burners, unions. Malleable Iron Fittings Co., Branford, Conn.

**Brazarc**—Electrodes. Universal Power Corp., Cleveland, O.

**Brazo**—Solder. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

**Breeze Spreader**—Propeller fans. Victor Electric Products, Inc., Cincinnati, O.

**Breezo**—Fans. Buffalo Forge Co., Buffalo, N. Y.

**Bro-For**—Boiler compounds. Brown-Ford Corp., Newton, Mass.

**Bronzend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**Broomell**—Eliminators, floats, heating systems, traps, valves. Vapor Specialty Co., New York, N. Y.

**Brownweld** — Finned tubing. Brown Fintube Co., The, Elyria, O.

**BTUnit**—Unit heaters. Industrial Mfg. & Engineering Co., Chicago, Ill.

**Bulldog**—Shears and snips. Wiss & Sons Co., J., Newark, N. J.

**Bull Dog**—Stocks and dies. Oster Mfg. Co., Cleveland, O.

**Bunker Hill** — Fittings, pipe, sheets, solder. Northwest Lead Co., Seattle, Wash.

**Burks**—Pumps. Decatur Pump Co., Decatur, Ill.

**Burnham** — Compressors, condensers, pumps. Union Steam Pump Co., Battle Creek, Mich.

**Butler**—Stokers. Eddy Stoker Corp., Chicago, Ill., and Whiting Stoker Co., Chicago, Ill.

**C-E**—Boilers, burners, stokers. Combustion Engineering Co., New York, N. Y.

**C-H**—Controllers and starters, heaters, relays, switches, valves. Cutler-Hammer, Inc., Milwaukee, Wis.

**CJB**—Bearings. Ahlberg Bearing Co., Chicago, Ill.

**C & M**—Hangers or brackets. Carty & Moore Engineering Co., Detroit, Mich.

**CMH** — Bellows. Chicago Metal Hose Corp., Maywood, Ill.

**C.M.W.**—Stokers. Catskill Metal Works, Inc., Catskill, N. Y.

**COM**—Blowers. Wing Mfg. Co., L. J., New York, N. Y.

**CW**—Pipe. Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.

**Cadillac** — Meters. Central Station Steam Co., Detroit, Mich.

**Cadman**—Valves. Barrett Machine Co., N. S. Pittsburgh, Pa.

**Cadwell**—Pressure regulators, valves. Beaton & Cadwell Mfg. Co., New Britain, Conn.

**Calicel**—Insulation. Celotex Corp., The, Chicago, Ill.

**Calistone**—Insulation. Celotex Corp., The, Chicago, Ill.

**Calktite**—Cement and compounds. U. S. Stoneware Co., New York, N. Y.

**Caloride**—Dehumidifiers. Solvay Sales Corp., New York, N. Y.

**Calorider**—Dehumidifiers. General Air Conditioning Corp., Cincinnati, O.

**Calorider** — Dehumidifiers, humidifiers, unit air conditioners. Research Corp., New York, N. Y.

**Cantilever** — Hygrometers. Standard Thermometer, Inc., Boston, Mass.

**Capillary**—Air washers, dehumidifiers, humidifiers, unit air conditioners. Air & Refrigeration Corp., New York, N. Y.

**Capitol**—Boilers, hangers or brackets, heaters, radiation. United States Radiator Corp., Detroit, Mich.

**Capitol**—Insulation. Standard Lime & Stone Co., Baltimore, Md.

**Capitolaire** — Unit air conditioners. United States Radiator Corp., Detroit, Mich.

**Careyduct** — Ducts and duct fittings. Carey Mfg. Co., Philip, Cincinnati, O.

**Carstenite**—Insulation. Technical Ply-Woods, Chicago, Ill.

**Cash-Acme** — Heating systems, pipe strainers, regulators, valves, water feeders. Cash Valve Mfg. Co., A. W., Decatur, Ill.

**Castirnarc** — Electrodes. Universal Power Corp., Cleveland, O.

**Castolin** — Solder and welding rod. Eutectic Welding Alloys Co., New York, N. Y.

**Cast-Refract** — Refractories. Quigley Co., Inc., New York, N. Y.

**Cataract** — Centrifugal pumps. Red Jacket Mfg. Co., Davenport, Ia.

**Causal** — Valves. Lunkenheimer Co., Cincinnati, O.

**Cell-U-Blanket** — Insulation. Masonite Corp., Chicago, Ill.

**Cellufoam**—Insulation. Masonite Corp., Chicago, Ill.

**Celoron**—Couplings. Continental Diamond Fibre Co., Newark, Del.

**Celo-Siding**—Insulation. Celotex Corp., The, Chicago, Ill.

**Cementseal** — Enamels and lacquers. Acorn Refining Co., Cleveland, O.

**Cemesto** — Insulation. Celotex Corp., The, Chicago, Ill.

**Central**—Conduit. Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.

**Centri-Jet**—Centrifugal pumps. Red Jacket Mfg. Co., Davenport, Ia.

**Centrimax**—Meters. Leeds & Northrup Co., Philadelphia, Pa.

**Centripac** — Packing. Johns-Manville, New York, N. Y.

**Centripeller**—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

**Centrispray** — Air conditioning units. Bahnson Co., Winston-Salem, N. C.

**Certified**—Air conditioning units, furnaces, tanks. Stainless & Steel Products Co., St. Paul, Minn.

**Chaco**—Cement and compounds, boiler and radiator sealing compounds. Desolvo Co., The, Pittsburgh, Pa.

**Challenger** — Stokers. Link-Belt Co., Chicago, Ill.

**Champion** — Furnaces, heaters. National Heater Co., Minneapolis, Minn.

**Charm**—Radiation. Thatcher Furnace Co., Garwood, N. J.

**Chevron** — Packing. Garlock Packing Co., Palmyra, N. Y.

**Chicago**—Brakes. Dreis & Krump Mfg. Co., Chicago, Ill.

**Chicago-Wrigley**—Bolts. Chicago Expansion Bolt Co., Chicago, Ill.

**Chico Brikset**—Cement. Chicago Fire Brick Co., Chicago, Ill.

**Chief** — Packing. Keasbey & Mattison Co., Ambler, Pa.

**Chieftain** — Compressors. Tecumseh Products Co., Tecumseh, Mich.

**Chill-Vactor** — Steam jet compressors. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

**Chinook** — Ferrous heating surface. Bayley Blower Co., Milwaukee, Wis.

**Chinookfin** — Non-ferrous heating surface. Bayley Blower Co., Milwaukee, Wis.

**Chip Chaser**—Stocks and dies. Oster Mfg. Co., Cleveland, O.

**Chromalox**—Preheaters, unit heaters. Wiegand Co., Edwin L., Pittsburgh, Pa.

**Chromend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**Chronoflo** — Flow meters, recorders. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

**Chronometer**—Valves. Defender Instrument & Regulator Co., St. Louis, Mo.

**Chronotherm**—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Cinch**—Expansion bolts. National Lead Co., New York, N. Y.

**Circle T**—Switches. Trumbull Electric Co., Plainville, Conn.

**Circo**—Louvers and shutters. Circulators & Devices Mfg. Co., New York, N. Y.

**CirCOOLator**—Fans, ventilators. Viking Air Conditioning Corp., Cleveland, O.

**Clamp-A-Leak** — Pipe repair clamps. Chelsea Metal Stamping Co., New York, N. Y.

**Clarco**—Unit heaters. Clarage Fan Co., Kalamazoo, Mich.

**Clark-Sundh** — Motor controls. Clark Controller Co., Cleveland, O.

**Classic**—Registers. Auer Register Co., Cleveland, O.

**Cleanair**—Aftercoolers. Bell & Gossett Co., Morton Grove, Ill.

**Cleanduct**—Air filters. Research Products Corp., Madison, Wis.

**Cle-Bar**—Heaters. Cleghorn Co., Boston, Mass.

**Climate Changer**—Unit air conditioners, unit air coolers. Trane Co., The La Crosse, Wis.

**Closin** — Bolts. Star Expansion Bolt Co., New York, N. Y.

**Cocheco**—Belting. Williams & Son, J. B., Dover, N. H.

**Cochrane-Becker** — Pumps. Cochrane Corp., Philadelphia, Pa.

**Code-Craft**—Headers, heaters, preheaters, tanks. Zallea Brothers & Johnson, Wilmington, Del.

**Coey**—Cooling towers. Research Corp. New York, N. Y.

**Colalloy**—Couplings, fittings, flanges nipples, pipe, sheets, structural shapes tubing, unions, valves. Colonial Alloys Co., Metals Div., Philadelphia Pa.

**Cold Stream**—Unit air conditioners Baker Ice Machine Co., Inc., Omaha Nebr.

**Colonial** — Registers. Auer Register Co., Cleveland, O.

**Columbia**—Odor adsorbers. Carbide and Carbon Chemicals Corp., New York N. Y.

**Columbia**—Ventilators. E. E. Souther Iron Co., St. Louis, Mo.

**Combustioneer**—Stokers. Steel Products Engineering Co., Springfield, O.

**Comet**—Fans, unit heaters. New York Blower Co., Chicago, Ill.

**Comfort-Air** — Humidifiers. Comfort Products Corp., Harvey, Ill.

**Comfort Panel**—Radiation. Columbus Radiator Co., McKeesport, Pa.

**Comfortrol**—Effective temperature control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

**Comfostat**—Thermostats. Johnson Service Co., Milwaukee, Wis.

**Co-Min-Co**—Insulating cement. United States Mineral Wool Co., Chicago, Ill.

**Compact**—Radiation. Kohler Co., Kohler, Wis.

**Compass**—Belting. Goodyear Tire & Rubber Co., Akron, O.

**Concavex** — Bearings. Shafer Bearing Corp., Chicago, Ill.

**Conco** — Boiler cleaning compounds water treatment. Continental Products Co., Euclid, O.

**Condor**—Belting, V belts, pipe. Manhattan Rubber Mfg. Div. of Raybestos Manhattan, Inc., Passaic, N. J.

**Condo-Vac** — Vacuum pumps. Chicago Pump Co., Chicago, Ill.

**Coni-Vane**—Ventilators. Allen Corp. Detroit, Mich.

**Con-Tac-Tor** — Switches. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

**Continental** — Stokers. Eddy Stoker Corp., Chicago, Ill., and Whiting Stoker Co., Chicago, Ill.

**Control-O-Gas** — Valves. Payne Furnace & Supply Co., Inc., Beverly Hills Calif.

**Convector**—Humidifiers. Maid-O-Mist Inc., Chicago, Ill.

**Coolair**—Fans. American Coolair Corp. Jacksonville, Fla.

**Coolite** — Windows. Mississippi Glass Co., New York, N. Y.

**Coolmaster** — Unit coolers. Kramer Trenton Co., Trenton, N. J.

**Copaltite** — Cement and compounds gaskets. National Engineering Products, Inc., Washington, D. C.

**Copes**—Governors, steam desuperheaters, valves. Northern Equipment Co., Erie, Pa.

**Cop-R-Loy** — Sheets. Wheeling Steel Corp., Wheeling, W. Va.

**Coravol**—Corrosion treatment. Western Chemical Co., Kansas City, Mo.

**Corkoustic** — Insulation. Armstrong Cork Co., Lancaster, Pa.

**Cornelius**—Air compressors and regulators. North Penn Co., New York, N. Y.

**Cottrell** — Dust collectors. Research Corp., New York, N. Y.

**Cottrell** — Dust collectors. Western Precipitation Corp., Los Angeles, Calif.

**Crescent**—Boiler gage cocks. Wright-Austin Co., Detroit, Mich.

**Crescent** — Burner. Caloroil Burner Corp., Hartford, Conn.

**Crescent**—Unions. Star Mfg. Co., Inc., Providence, R. I.

**Crescent**—Valves. Powell Co., Wm., Cincinnati, O.

**Cromaloy**—Solder. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

**Crown**—Cement and compounds. Colebrook & Sons, Inc., W. H., Syracuse, N. Y.

**Crucibleweld** — Electrodes. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Cub 100**—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

**Cushiontone** — Insulation. Armstrong Cork Co., Lancaster, Pa.

**Cut Master** — Vertical turret lathes. Bullard Co., The, Bridgeport, Conn.

**Cutno**—Packing. Greene, Tweed & Co., New York, N. Y.

**Cycloidal**—Air washers. Blower Application Co., Milwaukee, Wis.

**Cyclops**—Roller bearings. Roller Bearing Co. of America, Trenton, N. J.

**Cyclotherm** — Boilers. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

**Cyclotherm** — Boilers. General Furnaces Corp., New York, N. Y.

**DH**—Ball bearings. Dodge Mfg. Corp., Mishawaka, Ind.

**D & H**—Evaporative condensers, cooling and heating surfaces, unit air conditioners. Drayer & Hanson, Inc., Los Angeles, Calif.

**DL**—Filters, gages, regulators, relays, switches, thermostats, valves. Detroit Lubricator Co., Detroit, Mich.

**DV**—Speed changers, v-belt drives. Dodge Mfg. Corp., Mishawaka, Ind.

**Damit**—Caulking compounds. Quigley Co., Inc., New York, N. Y.

**Dana**—Exhausters, fans, louvers, ventilators. Klee Co., Geo. B., Cincinnati, O.

**Dart** — Unions. Fairbanks Co., New York, N. Y.

**Day-Steel** — Pulleys. Dayton Rubber Mfg. Co., Dayton, O.

**Dean**—Cleaners. Pierce Co., Wm. B., The, Buffalo, N. Y.

**Defender** — Heaters. Handley Brown Heater Co., Jackson, Mich.

**Deflect-O-Grille**—Grilles. U. S. Air Conditioning Corp., Minneapolis, Minn.

**De Luxe** — Strainers. Blackmer Pump Co., Grand Rapids, Mich.

**Demandtrol**—Valves. Sullivan Valve & Engineering Co., Butte, Mont.

**Demon Air-Set**—Refractories. Plibrico Jointless Firebrick Co., Chicago, Ill.

**Dereka** — Protective coatings. Debevoise Co., The, Brooklyn, N. Y.

**De-Sta-Co.**—Fan housings, pipe clamps, valves. Detroit Stamping Co., Detroit, Mich.

**Detroit** — Traps. Nason Co., Detroit, Mich.

**Detroit LoStoker** — Stokers. Detroit Stoker Co., Detroit, Mich.

**Detroit Unistoker** — Stokers. Detroit Stoker Co., Detroit, Mich.

**Dew-Aire** — Air conditioning units. Standard Computing Scale Co., The, Air Conditioning & Refrigeration Div., Detroit, Mich.

**Dexter**—Valve reseaters. Leavitt Machine Co., Orange, Mass.

**Dexter-Goebel** — Systems, regulators. National Brass Co., Grand Rapids, Mich.

**Di-Acro** — Benders, brakes, shears. O'Neil Irwin Mfg. Co., Minneapolis, Minn.

**Diamond Fibre**—Gaskets. Continental Diamond Fibre Co., Newark, Del.

**Diamond H** — Switches, thermostats. Hart Mfg. Co., Hartford, Conn.

**Dickbelt**—Belting. Dick Co., Inc., R. & J., Passaic, N. J.

**Dickinson Ferrocast** — Exhaust heads, ventilators. Aeolus Dickinson, Chicago, Ill.

**Dickrope**—V belts. Dick Co., Inc., R. & J., Passaic, N. J.

**Difr-enshal-Vacm** — Heating systems. Dunham Co,, C. A., Chicago, Ill.

**Dike**—Furnace cement. Klee Co., Geo. B., Cincinnati, O.

**Dilecto**—Plastic pipe. Continental Diamond Fibre Co., Newark, Del.

**Direct**—Pipe fittings and flanges, separators, strainers. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

**Directherm**—Direct fired heaters. Airtherm Mfg. Co., St. Louis, Mo.

**Discfin**—Cooling surface. General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.

**Disc-Loc**—Registers. Knowles Mushroom Ventilator Co., Montclair, N. J.

**Distributor**—Radiation. Kehm Corp., The, Chicago, Ill.

**Divide** — Separators. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

**Dixigas**—Gas welding rod. Atlantic Steel Co., Atlanta, Ga.

**Do-All**—Combination hammer and drill. Wodack Electric Tool Corp., Chicago, Ill.

**Dominion**—Gaskets, packing. Darcoid Co., Inc., New York, N. Y.

**Double Check** — Boiler compounds. Hampton-Cross Co., The, Louisville, Ky.

**Double Diamond** — Hygrometers, recorders, psychrometers. H-B Instrument Co., Philadelphia, Pa.

**Double-Seal** — Copper tube fittings. Hays Mfg. Co., Erie, Pa.

**Double U**—Packing. Wayne Davies & Co., Worcester, Mass.

**Dowmetal**—Sheets, structural shapes, welding rod. Dow Chemical Co., Midland, Mich.

**Downblast**—Unit heaters. Sturtevant Co., B. F., Boston, Mass.

**Down Flo**—Unit heaters. McQuay, Inc., Minneapolis, Minn.

**Dowtherm** — Process heating systems. Dow Chemical Co., The, Midland, Mich.

**Draftender**—Dampers and damper regulators. Penn Electric Switch Co., Goshen, Ind.

**Draftite**—Cement. Keasbey & Mattison Co., Ambler, Pa.

**Draft-O-Stat** — Barometric controls. Hotstream Heater Co., Cleveland, O.

**Draftrite**—Gages. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

**Drainator**—Traps. Coe Mfg. Co., Painesville, O.

**Drain-Dri**—Sump pumps. Yeomans Bros. Co., Chicago, Ill.

**DriAir**—Dehumidifiers. Tamms Silica Co., Chicago, Ill.

**Dry-Ex**—Water chillers. Acme Industries, Inc., Jackson, Mich.

**Dry-Ice**—Refrigerants. Pure Carbonic, Inc., New York, N. Y.

**Dry-paC** — Insulation. Ric-wiL Co., Cleveland, O.

**Dualarc**—Arc welders. Electric Arc, Inc., Newark, N. J.

**Dual-Clone**—Dust collectors. Day Co., The, Minneapolis, Minn.

**Dualsteel**—Unions. Rockwood Sprinkler Co., Worcester, Mass.

**Dubblseal**—Insulation. Masonite Corp., Chicago, Ill.

**Dubestos** — Ducts and duct fittings. Dutton Asbestos & Supply Co., San Francisco, Calif.

**Duco**—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.

**Ductatherm** — Thermostats. Mercoid Corp., The, Chicago, Ill.

**Ductype**—Fans. South Bend Air Products Corp., South Bend, Ind.

**Dulux**—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington. Del.

**Dunco**—Relays, switches. Dunn, Inc., Struthers, Philadelphia, Pa.

**Duo Blo**—Furnaces. American Furnace Co., St. Louis, Mo.

**Duoflo**—Pipe line strainers. Sheffler-Gross Co., Philadelphia, Pa.

**Duo-Stat** — Heating systems, thermostats. Johnson Service Co., Milwaukee, Wis.

**Duotrol**—Regulators. Automatic Control Co., St. Paul, Minn.

**Duplex**—Insulation. Keasbey & Mattison Co., Ambler, Pa.

**Duplex**—Pipe cutting machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

**Duplex**—Pipe line strainers. Maid-O'-Mist, Inc., Chicago, Ill.

**Duplex**—Tubing, Bridgeport Brass Co., Bridgeport, Conn.

**Durabilt**—Observation ports. Chicago Fire Brick Co., Chicago, Ill.

**DuraBilt** — Registers. Auer Register Co., Cleveland; O.

**Duradiant**—Gas burners. Selas Corp. of America, Philadelphia, Pa.

**Dura-Flex**—Registers. Auer Register Co., Cleveland, O.

**Dura-Fram**—Valves. Detroit Lubricator Co., Detroit, Mich.

**Dura-Line**—Registers. Auer Register Co., Cleveland, O.

**Durant** — Pipe. Ehret Magnesia Mfg. Co., Valley Forge, Pa.

**DuraSpeed**—Sprinkler heads. Grinnell Co., Inc., Providence, R. I.

**Durco** — Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

**Durcopump**—Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

**Durex** — Bearings. General Motors Corp., Moraine Products Div., Dayton, O.

**Durichlor**—Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

**Durimet** — Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

**Duro Gloss**—Steel sheets. Jessop Steel Co., Washington, Pa.

**Duroline** — Pipe. National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.

**Duroplastic** — Caulking compounds. Acorn Refining Co., Cleveland, O.

**Dustkop**—Dust collectors. Aget-Detroit Co., Ann Arbor, Mich.

**Dust-Stop**—Air filters. Owens-Corning Fiberglass Corp., Toledo, O.

**Dustube** — Dust collectors. American Foundry Equipment Co., Mishawaka, Ind.

**Dutch Boy**—Solder. National Lead Co., New York, N. Y.

**Duxbak**—Leather belting and packing. Schieren Co.,, Chas. A., New York, N. Y.

**Dux-Sulation** — Insulation. Wilson, Inc., Grant, Chicago, Ill.

**Dynaflow** — Fans. South Bend Air Products Corp., South Bend, Ind.

**Dynetric**—Balancing equipment. Gisholt Machine Co., Madison, Wis.

**E-C**—V belts. Goodyear Tire & Rubber Co., Akron, O.

**E C & M**—Motor controls, switches. Electric Controller & Mfg. Co., Cleveland, O.

**E.Z.**—Hangers or brackets, soot destroyers. Healy Ruff Co., St. Paul, Minn.

**Eafco**—Fittings. Eastern Foundry Co., Boyertown, Pa.

**Eastern**—Tanks. Case & Son Mfg. Co., W. A., Buffalo, N. Y.

**Easternoil**—Oil burners. Eastern Oil Equipment Co., Portland, Me.

**Easyclean**—Strainers. Wright-Austin Co., Detroit, Mich.

**Easy-Flo**—Solder. Handy & Harman, New York, N. Y.

**Easyweld**—Electrodes. Universal Power Corp., Cleveland, O.

**Eclipse** — Compressors. Frick Co., Waynesboro, Pa.

**Eclipse**—Alarms, governors, regulators, traps, valves. Illinois Engineering Co., Chicago, Ill.

**Eclipse**—Hose. Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.

**Econolux**—Boilers. Johnson Co., S. T., Oakland, Calif.

**Econ-o-matic**—Bases. American Pulley Co., Philadelphia, Pa.

**Economizer** — Nozzles. Bahnson Co., Winston-Salem, N. C.

**Economy** — Boilers, heaters. International Heater Co., Utica, N. Y.

**Economy**—Heating systems. Maid-O'-Mist, Inc., Chicago, Ill.

**Economy**—Regulators. Dockson Corp., Detroit, Mich.

**Economy**—Unit ventilators. Arex Co., Chicago, Ill.

**Econovent**—Ventilators. Western Engineering & Mfg. Co., Los Angeles, Calif.

**Edgeseal**—Air filters. Wilson & Co., Chicago, Ill.

**Efflco**—Louvers and shutters. Hirschman Co., W. F., Buffalo, N. Y.

**"88"** — Pipe covering. Eagle-Picher Lead Co., Cincinnati, O.

**88-A**—Pipe vise stands. Nye Tool & Machine Co., Chicago, Ill.

**Ejectoplaque**—Air diffusers. Air & Refrigeration Corp., New York, N. Y.

**Elasto Rib**—Vibration isolating bases. Korfund Co., Long Island City, N. Y.

**Electric Filter Watchman**—Gages. Herbusch Corp., The, St. Louis, Mo.

**Electrifugal**—Centrifugal pumps. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Electro-Matic**—Air cleaners. American Air Filter Co., Inc., Louisville, Ky.

**Electromode**—Electric heaters. Electric Air Heater Co., Div. American Foundry Equipment Co., Mishawaka, Ind.

**Electro-Sheet**—Sheets. American Brass Co., Waterbury, Conn.

**Electro-Wind**—Ventilators. Allen Corp., Detroit, Mich.

**Electrozone**—Ozone apparatus. Automatic Pump & Softener Corp., Rockford, Ill.

**Electrunite** — Stainless steel tubing. Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.

**Elesco**—Fuel economizers, superheaters. Combustion Engineering Co., Inc., New York, N. Y.

**Elgin**—Arc welders. Borm Mfg. Co., Elgin, Ill.

**Elgin** — Louvers and shutters. Elgo Shutter & Mfg. Co., Detroit, Mich.

**Elite**—Registers. Auer Register Co., Cleveland, O.

**Elm**—Dampers. Elgo Shutter & Mfg. Co., Detroit, Mich.

**Elsco**—Electric motors. Electric Spray-it Co., Sheboygan, Wis.

**Elturn**—Duct turning vanes. Barber-Colman Co., Rockford, Ill.

**Embee**—Cement and compounds. Montgomery Bros., San Francisco, Calif.

**Emco**—Meters, regulators. Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

**Emergency**—Steam traps. Wright-Austin Co., Detroit, Mich.

**Enamel-Kote**—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

**Enco**—Burners, regulators. Engineer Co., New York, N. Y.

**Enduro**—Packing. Keasbey & Mattison Co., Ambler, Pa.

**Enduro** — Pipe, sheets, tubing. Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.

**Enduro**—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

**Entrained Combustion** — Gas burners. Mettler Co., Lee B., Los Angeles, Calif.

**Equatherm**—Zone control thermostat. Tallmadge & Co., Webster, East Orange, N. J.

**Equiflo** — Valves. Grinnell Co., Inc., Providence, R. I.

**Eroduct**—Insulation. Ehret Magnesia Mfg. Co., Valley Forge, Pa.

**Erwin**—Dampers. Elgo Shutter & Mfg. Co., Detroit, Mich.

**Esso**—Oil burners. Gilbert & Barker Mfg. Co., West Springfield, Mass.

**Esso Bond**—Refractories. Ramtite Co., The, Chicago, Ill.

**Eureka**—Valves. Ohio Pattern Wks. & Foundry Co., Eureka Valve Div., Cincinnati, O.

**Evactor**—Pumps. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

**Evapotrol**—Valves. Alco Valve Co., St. Louis, Mo.

**Evco**—Valves. Electric Valve Mfg. Co., Inc., New York, N. Y.

**Evenaction** — Valves. Taylor Instrument Companies, Rochester, N. Y.

**Everlast** — Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

**Evrtyte**—Valves. Strong, Carlisle & Hammond Co., Cleveland, O.

**Excel**—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

**Excelsior**—Pumps. Foster Pump Works, Inc., Brooklyn, N. Y.

**Excelso** — Water heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Exhaustair**—Fans. New York Blower Co., Chicago, Ill.

**Exidust**—Dust collectors. Allen Billmyre Co., Mamaroneck, N. Y.

**Extra Dry Esotoo**—Liquid sulphur dioxide. Virginia Smelting Co., West Norfolk, Va.

**Eye-Hye**—Gages. Reliance Gauge Column Co., Cleveland, O.

**E-Z-ON** — Damper quadrants. Gerett Corp., M. A., Milwaukee, Wis.

**Ezy-Kleen**—Strainers. Blackmer Pump Co., Grand Rapids, Mich.

**F & E**—Stokers. Flynn & Emrich Co., Baltimore, Md.

**Fabrikated** — Grilles, registers. Independent Register Co., Cleveland, O. New York, N. Y.

**Faircoseal** — Valves. Fairbanks Co., New York, N. Y.

**Fan-Air** — Gas burners. Mettler Co., Lee B., Los Angeles, Calif.

**Fanmix**—Burners. Coppus Engineering Corp., Worcester, Mass.

**Far-Air**—Air conditioning units, filters, humidifiers. Farr Co., Los Angeles, Calif.

**Farnsworth** — Pumps. O'Brien Steam Specialty Co., Syracuse, N. Y.

**Farragut**—Packing. Darcoid Co., Inc. New York, N. Y.

**Fast's**—Couplings. Koppers Co., Bartlett Hayward Div., Baltimore, Md.

**Favorite** — Ratchet wrenches. Greene, Tweed & Co., New York, N. Y.

**Featherfin**—Heating and cooling surface. Wing Mfg. Co., L. J., New York, N. Y.

**Featherweight** — Unit heaters. Wing Mfg. Co., L. J., New York, N. Y.

**Fel-Pro**—Gaskets, packing. Felt Products Mfg. Co., Chicago, Ill.

**Felt Cote** — Metal sheets. American Steel Band Co., Pittsburgh, Pa.

**Fenestra** — Heat insulating windows. Detroit Steel Products Co., Detroit, Mich.

**Fenn's Rotary**—Ventilators. Waverly Heating Supply Co., Boston, Mass.

**Fenox**—Compounds. Halowax Products Div., Union Carbide & Carbon Corp., New York, N. Y.

**Fero** — Radiation. Burnham Boiler Corp., Irvington, N. J.

**Ferrenewo**—Valves. Lunkenheimer Co., Cincinnati, O.

**Ferroclad** — Insulation. Truscon Steel Co., Youngstown, O.

**Ferro-Therm** — Insulation. American Flange & Mfg. Co., Inc., New York. N. Y.

**Ferroweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Fiberglas**—Insulation. Owens-Corning Fiberglas Corp., Toledo, O.

**Fiberlite** — Insulation. Insulite Co. Minneapolis, Minn.

**Filmflo** — Deaerators. Croll-Reynolds Engineering Co., Inc., New York N. Y.

**Fin-Flex** — Registers. Auer Register Co., Cleveland, O.

**Findlay**—Stokers. Central Rubber & Steel Corp., Findlay, O.

**Fin-Line** — Registers. Auer Register Co., Cleveland, O.

**Firecrete** — Refractories. Johns-Manville, New York, N. Y.

**Fire-Felt**—Insulation. Johns-Manville New York, N. Y.

**Fire-Guard** — Stokers. Peerless Mfg Corp., Louisville, Ky.

**Fire-Hearth** — Refractories. Fireline Stove & Furnace Lining Co., Chicago Ill.

**Fire Tender**—Stokers. Holcomb & Hoke Mfg. Co., Indianapolis, Ind.

**Firefoil**—Insulating panel. Carey Mfg Co., Philip, Cincinnati, O.

**Fireite**—Furnace cement, refractories Johns-Manville, New York, N. Y.

**Fireline**—Refractories. Fireline Stove & Furnace Lining Co., Chicago, Ill

**Fireset**—Refractories. Walsh Refractories Corp., St. Louis, Mo.

**Fireye** — Alarms. Combustion Control Corp., Cambridge, Mass.

**Flatjet**—Spray nozzles. Spraying Systems Co., Chicago, Ill.

**Fleetweld**—Welding electrodes. Lincoln Electric Co., Cleveland, O.

**Fleet-X**—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

**Flexarc**—Arc welders. Westinghouse Electric & Mfg. Co., East Pittsburgh Pa.

**Flexair** — Grilles, registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Flexcord**—Drives. Gates Rubber Co. Denver, Colo.

**Flexeal** — Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick N. J.

**Flexiwound** — Gaskets. Azor Corp Irvington, N. J.

**Flexodisc** — Expansion joints. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

**Floatrol**—Switches. Automatic Control Co., St. Paul, Minn.

**Flex-Tube**—Analyzers, gages, manometers. Dwyer Mfg. Co., F. W., Chicago, Ill.

**Flo-Klean** — Filters, strainers. Cuno Engineering Corp., Meriden, Conn

**Flo-scope** — Meters. Selas Corp. of America, Philadelphia, Pa.

**Flotrol**—Humidifiers, valves. Cleveland Humidifier Co., Cleveland, O.

**Flo-watch** — Flow meters. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

**Flualyzer**—Analyzers. Engelhard, Inc. Chas., Newark, N. J.

**Fluid Heat** — Gasoline fired heaters. Anchor Post Fence Co., Fluid Heat Div., Baltimore, Md.

**Flush-Kleen** — Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

**Foamglas** — Insulation. Armstrong Cork Co., Lancaster, Pa.

**Foamglas**—Insulation. Pittsburgh Plate Glass Co., Pittsburgh, Pa.

**Force-Flo**—Circulators, heaters, regulators, systems, tanks. Kehm Corp. The, Chicago, Ill.

**Fordair**—Compressors. Schramm, Inc., West Chester, Pa.

**Forest Fleece**—Insulation. Doheny Co. John J., Belmont, Mass

**Fracto-Crete** — Refractories. Ramtite Co., The, Chicago, Ill.

**Francke**—Flexible couplings. Waldron Corp., John, New Brunswick, N. J.

**Free-Aire** — Air conditioning units heaters. Kehm Corp., The, Chicago Ill.

**Freeman**—Stokers. Illinois Iron & Bolt Co., Chicago, Ill.

**Fre-Flo** — Strainers. Fisher Governor Marshalltown, Ia.

**Freon** — Refrigerant. Kinetic Chemicals, Inc., Wilmington, Del.

**Frevent**—Valves. Bridgeport Brass Co., Bridgeport, Conn.

**Friction Fighter**—Bearings. Link-Belt Co., Indianapolis, Ind.

**Frictionized**—Belting. Baldwin Belting, Inc., New York, N. Y.

**Frigid**—High pressure blowers, propeller fan blades and fans. Circulators & Devices Mfg. Corp., New York, N. Y.

**Frigistat** — Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Frigitower**—Cooling towers. Thermal Industries, Indio, Calif.

**Frostaire** — Air conditioning units. Palmer Mfg. Corp., Phoenix, Ariz.

**Fuel Saver** — Boilers. International Boiler Works Co., East Stroudsburg, Pa.

**Fulljet**—Spray nozzles. Spraying Systems Co., Chicago, Ill.

**Fulscope** — Recorders, .recorder-controllers, regulators. Taylor Instrument Companies, Rochester, N. Y.

**Fybr-Tech**—Gaskets and sheets. Technical Ply-Woods, Chicago, Ill.

**Fyr-Feeder** — Stokers. American Coal Burner Co., Csicago, Ill.

**Fyrite**—Analyzers. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

**G. B. C.**—Fans. General Blower Co., Inc., Philadelphia, Pa.

**G-E** — Condensers. General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.

**G-E Glow**—Lamps. General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

**G-E Mazda**—Lamps. General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

**G-M** — Louvers and shutters. Gillian Mfg. Co., Detroit, Mich.

**G-Fin** — Cooling and heating surface. Griscom-Russell Co., The, New York,

**G-R**—Oil coolers, water chillers. Griscom-Russell Co:, The, New York, N. Y.

**G-R**—Unit coolers and air conditioners. General Refrigeration Div., Yates-American Machine Co., Beloit. Wis.

**Gast** — Filters, separators. Johnson Corp., Three Rivers, Mich.

**Gasweld** — Torches, welding rod and apparatus. Liquid Carbonic Corp., The, Chicago, Ill.

**Gasweld**—Welding and cutting apparatus. Ergolyte Mfg. Co., Philadelphia, Pa.

**Geddes**—Radiation. Fowler & Wolfe Radiator Co., Norristown, Pa.

**Gemaco** — Compressors. General Machinery Co., Spokane, Wash.

**Gemware** — Hygrometers, psychrometers, thermometers. G. M. Mfg. Co., New York, N. Y.

**Genuine Stillson**—Wrenches. Walworth Co., New York, N. Y.

**Germicidal** — Lamps. General Electric Co., Lamp Dept., Cleveland, O.

**Gerotor**—Rotary pumps. May Oil Burner Corp., Baltimore, Md.

**Geyser**—Water heaters. Thatcher Furnace Co., Garwood, N. J.

**Giant** — Radiator hangers. Western Hanger Co., San Francisco, Calif.

**Gilbarco** — Compressors, oil burners. Gilbert & Barker Mfg. Co., West Springfield, Mass.

**Gilsonite**—Protective coatings. Ohmlac Paint & Refining Co., Chicago, Ill.

**Gilt Edge**—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

**Gimco** — Insulation. National Gypsum Co., Buffalo, N. Y.

**Gland-Pakt**—Expansion joints. Yarnall-Waring Co., Philadelphia, Pa.

**Glazola** — Caulking compounds. Nebel Mfg. Co., Cleveland, O.

**Globack**—Pipe flanges. Midwest Piping & Supply Co., Inc., St. Louis, Mo.

**Globe**—Ventilators. Osborn Co., The J. M. & L. A., Cleveland, O.

**Glowan**—Gas burners. Martin, J. O. & C. U., San Francisco, Calif.

**Goetzerit**—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Gohi** — Sheets. Newport Rolling Mill Co., Newport, Ky.

**Gold Bond**—Insulation. National Gypsum Co., Buffalo, N. Y.

**Golden Rod** — Blower wheels, fans, heaters, unit air conditioners. Jaden Mfg. Co., Hastings, Neb.

**Goodyearite**—Packing. Goodyear Tire & Rubber Co., Akron, O.

**Grad-U-Motor** — Damper operators. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

**Gradustat** — Regulators, thermostats. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

**Gradutrol**—Diaphragm valves. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Graylite**—Insulation. Insulite Co., Minneapolis, Minn.

**Greastop**—Air filters. Air-Maze Corp., Cleveland, O.

**Grid** — Cooling and heating surface, radiation, unit heaters. Murray Mfg. Co., D. J., Wausau, Wis.

**Grillometer**—Direct reading air velocity meters. Detroit Air Conditioning Service Co., Inc., Detroit, Mich.

**Gritseald**—Rotary pumps. St. Louis Tool Co., St. Louis, Mo.

**Gruvagrip** — Couplings. Gustin Bacon Mfg. Co., Kansas City, Mo.

**Guardian**—Gaskets. Garlock Packing Co., Palmyra, N. Y.

**Gun-Pakt**—Expansion joints. Yarnall-Waring Co., Philadelphia, Pa.

**Guthfan**—Fans. Guth Co., Edwin F., St. Louis, Mo.

**H & C** — Grilles, registers. Hart & Cooley Mfg. Co., Holland, Mich.

**H.C.**—Stokers. Whiting Stoker Co., Chicago, Ill.

**H-O-H** — Compounds, feeders, steam system and water treatment. Haering & Co., Inc., D. W., Chicago, Ill.

**H-T** — Smoke alarms. Au-Temp-Co Corp., New York, N. Y.

**Hairbestos**—Insulation. Wilson & Co., Chicago, Ill.

**Haircraft**—Insulation. Wilson & Co., Chicago, Ill.

**Hammerkraft** — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

**Hammermill**—Belting. Goodyear Tire & Rubber Co., Akron, O.

**Hammer-On**—Damper quadrants. Air Control Products, Inc., Coopersville, Mich.

**Hammer-Set** — Bolts. Rawlplug Co., Inc., The, New York, N. Y.

**Handy**—Benders. Holsclaw Bros., Inc., Evansville, Ind.

**Handy**—Ducts and duct fittings. Meyer & Bro. Co., F., Peoria, Ill.

**Handy Andy** — Vise stands. Western Wire Products Co., St. Louis, Mo.

**Hardweld** — Electrodes. Lincoln Electric Co., Cleveland, O.

**Hartman** — Air conditioning units. Norwood Filtration Co., The, Florence, Mass.

**Hartmann** — Heaters. Montgomery Bros., San Francisco, Calif.

**Haveg**—Tanks. Continental Diamond Fibre Co., Newark, Del.

**Hazleton** — Pumps, strainers, valves. Barrett, Haentjens & Co., Hazleton, Pa.

**Health-Air**—Ventilator and filter units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

**Health-Aire**—Fans, heaters, unit coolers, ventilators. Johnson Fan & Blower Co., Chicago, Ill.

**Heart-Oak**—Belting. Graton & Knight Co., Worcester, Mass.

**Heat-aid**—Refractories. Pyrolite Products Co., Cleveland, O.

**Heath-Crete**—Refractories. Quigley Co., Inc., New York, N. Y.

**Heatomat**—Heaters. Richmond Radiator Co., Gas Products Div., Uniontown, Pa.

**Heat-O-Meter** — Temperature regulators, thermostats. Miller Heat-O-Meter Co., Milwaukee, Wis.

**Heat-Rite**—Registers. Auer Register Co., Cleveland, O.

**Heat-Tite**—Insulating cement. Ramtite Co., The, Chicago, Ill.

**Heggie-Simplex**—Boilers. Lookout Boiler & Mfg. Co., Chattanooga, Tenn.

**Helical**—Tubing. Rome-Turney Radiator Co., Rome, N. Y.

**Hellite**—Refractories. Johns - Manville, New York, N. Y.

**Hensel**—Welders. Maple Valley Mfg. Co., Mapleton, Ia.

**Herco**—Arc welders. Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.

**Herculoy**—Welding rod, tubing. Revere Copper and Brass, Incorporated, New York, N. Y.

**Hevikoat**—Electrodes. Universal Power Corp., Cleveland, O.

**Highflex**—Belting. Goodrich Co., B. F., Akron, O.

**High-Ten-500**—Solder. Industrial Service Laboratories, Milwaukee, Wis.

**Hi-Gloss**—Steel sheets. Jessop Steel Co., Washington, Pa.

**Hilger**—Chillers, refrigerating compressors, unit coolers, unit air conditioners, valves. XL Refrigerating Co., Inc., Chicago, Ill.

**Hi-Lift**—Pumps. Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.

**Hi-Lo**—Alarms. Yarnall-Waring Co., Philadelphia, Pa.

**Hi-Lo**—Pumps. Yeomans Bros. Co., Chicago, Ill.

**Hi-Seal**—Cement and compounds. Greene, Tweed & Co., New York, N. Y.

**Hi-Spra**—Spray nozzles. Thermal Industries, Indio, Calif.

**Hitchings**—Boilers. Burnham Boiler Corp., Irvington, N. Y.

**Hi-Temp**—Insulation. Carey Mfg. Co., Philip, Lockland, Cincinnati, O.

**Holby**—Valves. Boiler Room Equipment, Inc., New York, N. Y.

**Holdtite**—Solder. American Brass Co., Waterbury, Conn.

**Hollo-Tech**—Doors and panels. Technical Ply-Woods, Chicago, Ill.

**Holt**—Strainers, tube cleaners. Rosedale Foundry & Machine Co., Pittsburgh, Pa.

**Holtite**—Clamps. Yarnall-Waring Co., Philadelphia, Pa.

**Horneblende** — Caulking compounds. North American Fibre Products Co., The, Cleveland, O.

**Horton**—Tanks. Chicago Bridge & Iron Co., Chicago, Ill.

**Hot Shot**—Pumps. Yeomans Bros. Co., Chicago, Ill.

**Hot Spot**—Spot welders. Acme Electric Welder Co., Los Angeles, Calif.

**Hotpoint**—Water heaters. Edison General Electric Appliance Co., Inc., Chicago, Ill.

**Hovalco**—Valves. Homestead Valve Mfg. Co., Coraopolis, Pa.

**Huber**—Stokers. Flynn & Emrich Co., Baltimore, Md.

**Humidair**—Humidifiers. Skilbeck Mfg. Co., Kenosha, Wis.

**Humid-Heet**—Radiators. Utica Radiator Corp., Utica, N. Y.

**Humidigrad** — Humidifiers. Cleveland Humidifier Co., Cleveland, O.

**Humidigraph** — Humidity recorders. Bristol Co., Waterbury, Conn.

**Humidiguide**—Hygrometers. Taylor Instrument Companies, Rochester, N. Y.

**Humidostat**—Humidistats. Johnson Service Co., Milwaukee, Wis.

**Humiduct**—Humidifiers, unit air conditioners. Bahnson Co., Winston-Salem, N. C.

**Humi-Temps**—Unit air coolers. Larkin Coils, Inc., Atlanta, Ga.

**Humphrey**—Unit heaters. General Gas Light Co., Kalamazoo, Mich.

**Hurivent**—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Hycarb**—Electrodes. Universal Power Corp., Cleveland, O.

**Hydra** — Valves. Albright Equipment Co., Johnstown, Pa.

**Hydramotor**—Valves. General Controls Co., Glendale, Calif.

**Hydro**—Recorders. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

**Hydro**—Packing. Keasbey & Mattison Co., Ambler, Pa.

**Hydro-Clone** — Condensers, dust collectors, welding fume exhausters. Whiting Corp., Harvey, Ill.

**Hydro-Foil** — Pumps. Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif.

**Hydron**—Bellows, traps. Clifford Mfg. Co., Boston, Mass.

**Hydrovac**—Pumps. Ames Hydrovac Corp., Brooklyn, N. Y.

**Hydro-Whirl**—Dust collectors. Peters-Dalton, Inc., Detroit, Mich.

**Hy-Duty**—Blower wheels, fans. Schwitzer-Cummins Co., Indianapolis, Ind.

**Hylo**—Heating systems. Webster & Co., Warren, Camden, N. J.

**Hy-Power**—Shears and snips. Wiss & Sons Co., J., Newark, N. J.

**Hy-Speed**—Pipe vises. Reimuller Bros. Co., Franklin Park, Ill.

**Hy-Temp**—Cement, insulation. Keasbey & Mattison Co., Ambler, Pa.

**Hytempite**—Cement, refractories. Quigley Co., Inc., New York, N. Y.

**Hy-Test**—Water heaters. Smith Co., Inc., H. B., The, Westfield, Mass.

**Hytherstat**—Combination humidity and temperature control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

**Hytor**—Pumps. Nash Engineering Co., South Norwalk, Conn.

**I-R**—Ingersoll-Rand, New York, N. Y.

**Ice Engine**—Gas and diesel engines. Waukesha Motor Co., Waukesha, Wis.

**Ice-O-Matic** — Refrigerating compressors. Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

**Icy-Flo**—Accumulators. McQuay, Inc., Minneapolis, Minn.

**Ideal**—Blowers. Perfection Grate & Stoker Co., Springfield, Mass.

**Ideal**—Boilers, water heaters, valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Ideal**—Ventilators. Tuttle & Bailey, Inc., New Britain, Conn.

**Ideal**—Traps. Nason Co., Detroit, Mich.

**Immersatherm** — Thermostats. Mercoid Corp., The, Chicago, Ill.

**Impact**—Spray nozzles. Cooling Tower Co., Inc., The, Div. of the Fluor Corp., Ltd., New York, N. Y.

**Imperial**—Boilers. National Radiator Co., The, Johnstown, Pa.

**Inco**—Pipe fittings, pipe, rod, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

**Inconel**—Pipe fittings, pipe, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

**IngAclad**—Stainless clad sheets. Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.

**In-Hib-Co**—Protective coatings. Haering Co., Inc., D. W., Chicago, Ill.

**Inkstop** — Air filters. Air-Maze Corp., Cleveland, O.

**Ins-lite**—Insulation. Insulite Co., Minneapolis, Minn.

**Instant**—Heaters, preheaters. Johnson Corp., Three Rivers, Mich.

**Insulag**—Insulation. Quigley Co., Inc., New York, N. Y.

**Insulblox** — Insulation, refractories. Quigley Co., Inc., New York, N. Y.

**Insulbrix**—Refractories. Quigley Co., Inc., New York, N. Y.

**Insulcrete**—Insulating cement, refractories. Quigley Co., Inc., New York, N. Y.

**Insulduct** — Ducts and duct fittings. Smith-Raymond Co., Columbus, Ga.

**Insulfil**—Insulation. Refractory & Insulation Corp., New York, N. Y.

**Insulmat**—Insulation. Mortell Co., J. W., Kankakee, Ill.

**Insulwool**—Insulation. General Insulating Products Co., Brooklyn, N. Y.

**Insutube**—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

**Integral Jet**—Burners. Stout & Sons, David, St. Louis, Mo.

**Intensarc**—Electrodes. National Carbon Co., New York, N. Y.

**Inter-Matic**—Time switches. International Register Co., Chicago, Ill.

**Involute**—Spray nozzles. Yarnall-Waring Co., Philadelphia, Pa.

**Ionaire**—Ionization apparatus. Electroaire Corp., Chicago, Ill.

**Irenew**—Powell Co., Wm., Cincinnati, Ohio.

**Iron Lung** — Ventilators. Powermatic Ventilator Co., Cleveland, O.

**Ironset** — Furnace cement. Fireline Stove & Furnace Lining Co., Chicago, Ill.

**J & C**—Fans, furnaces, heaters. Jackson & Church Co., Saginaw, Mich.

**J F S**—Speed changers. Stephens-Adamson Mfg. Co., Aurora, Ill.

**J-M Ball**—Floats, traps. Cryer Trap & Valve Co., Inc., New York, N. Y.

**Janitrol** — Burners, heaters, unit air conditioners. Surface Combustion, Toledo, O.

**Jarco**—Unions. Jarecki Mfg. Co., Erie, Pa.

**Jennings**—Pumps, ejectors. Nash Engineering Co., South Norwalk, Conn.

**Jetal**—Protective coatings. Alrose Chemical Co., Providence, R. I.

**Jewel**—Packing. Keasbey & Mattison Co., Ambler, Pa.

**John Crane**—Cement and compounds. Crane Packing Co., Chicago, Ill.

**Jones** — Stokers. Riley Stoker Corp., Worcester, Mass.

**Julian d'Este**—Controls, floats, governors, regulators, strainers, valves. Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.

**Junior**—Radiation. Weil-McLain Co., Chicago, Ill.

**Jusrite**—Ducts and duct fittings. Corbman Bros., Inc., Philadelphia, Pa.

**K**—Fittings. Kuhns Brothers Co., Dayton, O.

**K. A. T.**—Compounds and water treatment. American K.A.T. Corp., New York, N. Y.

**K-B**—Dampers, regulators. Kerentoff, G. L., Cincinnati, O.

**K-Fin**—Cooling and heating surface. Griscom-Russell Co., The, New York, N. Y.

**K and M**—Alarms, controls, strainers, traps, valves. Kieley & Mueller, Inc., North Bergen, N. J.

**K-S-V**—Ventilators. Kernchen Co., Chicago, Ill.

**Kable Kord**—Belting. Gilmer Co., L. H., Philadelphia, Pa.

**Kane**—Boilers, gas burners. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

**Karbate**—Carbon pipe, heat exchangers, pumps. National Carbon Co., New York, N. Y.

**Kathabar** — Dehumidifiers, humidifiers, unit air conditioners. Surface Combustion, Toledo, O.

**Kaukit**—Caulking compounds. Sonneborn Sons, Inc., L., New York, N. Y.

**Kearsarge**—Gaskets, packing. Johns-Manville, New York, N. Y.

**Kelly**—Valves. National Metal Products Corp., Chicago, Ill.

**Kentucky**—Sheets. Newport Rolling Mill Co., Newport, Ky.

**Key-Tite**—Cement and compounds. Key Co., East St. Louis, Ill.

**Kidskin**—Packing. Darcoid Co., Inc., New York, N. Y.

**Kimsul** — Insulation. Kimberly-Clark Corp., Neenah, Wis.

**King-clip**—Valves. Lunkenheimer Co., Cincinnati, O.

**King Coal**—Stokers. Eddy Stoker Corp., Chicago, Ill.

**King-Gage**—Gages. King Engineering Corp., Ann Arbor, Mich.

**Kleen Air**—Air filters. Kaye & MacDonald, Inc., West Orange, N. J.

**Kleen Tube**—Heaters. Vapor Car Heating Co., Inc., Chicago, Ill.

**Kleenflo** — Unit air filters. Air-Maze Corp., Cleveland, O.

**Klingtite**—Belting. Goodyear Tire & Rubber Co., Akron, O.

**Klixon**—Temperature controls. Spencer Thermostat Co., Attleboro, Mass.

**Klondike**—Arc welders. Fern, Ralph, Scranton, Pa.

**K-Master**—Strainers, traps. Kaye & MacDonald, Inc., West Orange, N. J.

**Knight-Ware** — Pipe, prefabricated ducts, valves. Knight, Maurice A., Akron, O.

**Knock-Out** — Arc welders. Lee Co., K. O., Aberdeen, S. D.

**Kno-Draft**—Air diffusers. Connor Engineering Corp., W. B., New York, N. Y.

**Koldboard** — Insulation. Baldwin-Hill Co., Trenton, N. J.

**Kool-Shade** — Solar heat resisting screens. Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.

**Kooler-Aire** — Commercial air conditioners. United States Air Conditioning Corp., Minneapolis, Minn.

**Korolac**—Protective coatings. Goodrich Co., B. F., Akron, O.

**Koroseal**—Plastic tubing, protective coatings. Goodrich Co., B. F., Akron, O.

**Koven**—Boilers. Waterfilm Boilers Inc., Jersey City, N. J.

**Kristokrak** — Enamels and lacquers. Zapon Div., Atlas Powder Co., North Chicago, Ill.

**Krupp**—Valves. Shank Co., Cyrus, Chicago, Ill.

**L. A.**—Motors. Louis Allis Co., Milwaukee, Wis.

**L-M**—Tubing. Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.

**L&N**—Regulators. Leeds & Northrup Co., Philadelphia, Pa.

**L-R**—Couplings. Lovejoy Flexible Couplings Co., Chicago, Ill.

**L. R. D.** — Valves. Grinnell Co., Inc., Providence, R. I.

**Laddi**—Heaters. Johnson Co., S. T., Oakland, Calif.

**Lawson**—Wrenches. USHCO Mfg. Co., Inc., Buffalo, N. Y.

**Lead-Sealed**—Lead sheets. Continental Steel Corp., Kokomo, Ind.

**Lectrodryer**—Dehumidifiers. Pittsburgh Lectrodryer Corp., Pittsburgh, Pa.

**Lectro Shear**—Shears. Black & Decker Mfg. Co., Towson, Md.

**Ledaloyl** — Sleeve bearings. Johnson Bronze Co., New Castle, Pa.

**Levelometer**—Gages, recorders. Liquidometer Corp., Long Island City, N. Y.

**Liberty**—Packing. Johns-Manville, New York, N. Y.

**Light Duty** — Pulleys. Gates Rubber Co., The, Denver, Colo.

**Lightning**—Cleaning compounds. Western Chemical Co., Kansas City, Mo.

**Lightweight Champion** — Pipe cutting machines. Nye Tool & Machine Co., Chicago, Ill.

**Lightweld**—Electrodes. Lincoln Electric Co., The, Cleveland, O.

**Lima**—Stokers. Carnes, Inc., John R., Lima, O.

**Limit-Load**—Centrifugal fans. Buffalo Forge Co., Buffalo, N. Y.

**Limitorque**—Valves. Philadelphia Gear Works, Inc., Philadelphia, Pa.

**Limpet**—Insulation. Keasbey & Mattison Co., Ambler, Pa.

**Linabestos**—Insulation. Celotex Corp., The, Chicago, Ill.

**Lin-X**—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

**Lipco**—Cement lined fittings and pipe. Cement Lined Pipe Co., Lynn, Mass.

**Lipman**—Compressors, cooling surface, water chillers. General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.

**Liquivator** — Steam traps. Morehead Mfg. Co., Detroit, Mich.

**Little Blacksmith** — Punches, shears. Kidder Mfg. Co., Inc., J. F., Burlington, Vt.

**Little Giant**—Stocks and dies. Greenfield Tap & Die Corp., Greenfield, Mass.

**Little Giant**—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

**Lloyd**—Solder and fluxes. Johnson Co., Lloyd S., Chicago, Ill.

**Lo-Blast**—Burners. National Machine Gas Burners, Div. of Mid-Continent Metal Products Co., Chicago, Ill.

**Locarb**—Electrodes. Universal Power Corp., Cleveland, O.

**Lockaire**—Insulation. Plastergon Wall Board Co., Buffalo, N. Y.

**Locktite**—Regulators. Ohio Products Co., Cleveland, O.

**Lodi**—Boilers. Super Mold Corp., Lodi, Calif.

**Lok-Joint** — Insulation. Insulite Co., Minneapolis, Minn.

**Lolag**—Heaters. American Instrument Co., Silver Spring, Md.

**Lo-Maintenance**—Motors and starters. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Longrip**—Pipe extractors. Ridge Tool Co., Elyria, O.

**Lord Burnham** — Boilers. Burnham Boiler Corp., Irvington, N. Y.

**Lowcost**—Boilers. Murray Iron Wks. Co., Burlington, Ia.

**Loxin**—Bolts. Star Expansion Bolt Co., New York, N. Y.

**Lubricore**—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Lul**—Unit coolers. Merchant & Evans Co., Philadelphia, Pa.

**Luminare**—Electrodes. Universal Power Corp., Cleveland, O.

**Lyonore**—Sheets. Lyon, Conklin & Co., Inc., Baltimore, Md.

**M. E.**—Motors. Marathon Electric Mfg. Corp., Wausau, Wis.

**M. & E.**—Refrigerating compressors and condensers. Merchant & Evans Co., Philadelphia, Pa.

**MGC**—Compressors. Hobart Bros. Co., Troy, O.

**M & M** — Alarms, cut-offs, feeders, humidifiers, operators, switches, valves. McDonnell & Miller, Chicago, Ill.

**M & S**—Gaskets, insulation. Mitchell & Smith, Inc., Detroit, Mich.

**MIF** — Couplings, fittings. Malleable Iron Fittings Co., Branford, Conn.

**MJL** — Gages, manometers, meters, recorders. Morey & Jones, Ltd., Los Angeles, Calif.

**MKO**—Boiler feeders, pumps. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

**M-R-C**—Ball bearings. Marlin-Rockwell Corp., Jamestown, N. Y.

**MTB** — Oil burners. John Zinc Co., Tulsa, Okla.

**M/W and A/C Airmat** — Air filters. American Air Filter Co., Inc., Louisville, Ky.

**Macheta**—Fans, fan blades, ventilators. Aerovent Fan Co., Piqua, O.

**Magic Grip** — Sheaves. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Magic-Weather** — Air washers, fans. Ballantyne Co., Omaha, Nebr.

**Majestic** — Boilers. Ames Iron Wks., Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

**Manganend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**Manganweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Mangenare** — Electrodes. Universal Power Corp., Cleveland, O.

**Mani-Ply**—Insulation. Keasbey & Mattison Co., Ambler, Pa.

**Mark Time**—Time switches, time delay relays. Rhodes, Inc., M. H., Hartford, Conn.

**Martell**—Packing. France Packing Co., Tacony, Philadelphia, Pa.

**Marval**—Valves. Marsh Corp., Jas. P., Chicago, Ill.

**Mascobond**—Furnace cement. Munn & Steele, Inc., Newark, N. J.

**Mascocement**—Refractories. Munn and Steele, Inc., Newark, N. J.

**Mascolite**—Pipe insulation. Munn and Steele, Inc., Newark, N. J.

**Mascote**—Insulation. Munn and Steele, Inc., Newark, N. J.

**Massachusetts** — Fans, unit heaters, blower wheels, air washers. Bishop & Babcock Mfg. Co., Cleveland, O.

**Master** — Stokers. Muncie Gear Wks., Inc., Muncie, Ind.

**Master** — Thermostats, regulators, switches. White Mfg. Co., St. Paul, Minn.

**Master**—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

**Master Kraft**—Oil burners, unit heaters. Harvey-Whipple, Inc., Springfield, Mass.

**Master Pilot**—Valves. Powell Co., Wm., Cincinnati, O.

**McDaniel** — Floats, traps. Watson & McDaniel Co., Philadelphia, Pa.

**McKee** — Blowers, boilers, burners, feeders, pumps, regulators, tanks, torches, valves. Eclipse Fuel Engineering Co., Rockford, Ill.

**McKeesport** — Radiation. Columbia Radiator Co., McKeesport, Pa.

**McKnight**—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Measurrench** — Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Mechanovent**—Ventilators. New York Blower Co., Chicago, Ill.

**Meco** — Torches, valves, welding rod. Modern Engineering Co., St. Louis, Mo.

**Melloblu**—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Mel-Rock**—Humidifiers, units, ventilators, washers. Mellish & Murray Co., Chicago, Ill.

**Merkustat** — Regulators, switches. Marsh Corp., Jas. P., Chicago, Ill.

**Merrill Process** — Heating systems. Parks-Cramer Co., Fitchburg, Mass.

**Metal-Master** — Shears. Wiss & Sons Co., J., Newark, N. J.

**Metermax** — Combustion control systems. Leeds & Northrup Co., Philadelphia, Pa.

**Metl-Tech** — Metal sheets. Technical Ply-Woods, Chicago, Ill.

**Metric**—Meters. American Meter Co. Inc., New York, N. Y.

**Metrotherm** — Thermostats. General Controls Co., Glendale, Calif.

**Micro**—Low water cut-offs. Maid-O-Mist, Inc., Chicago, Ill.

**Micro-Feed** — Humidifiers. Cleveland Humidifier Co., Cleveland, O.

**Micromax** — Hygrometers, recorders recorder-controllers, thermometers Leeds & Northrup Co., Philadelphia Pa.

**Micromet**—Water treatment. Calgon Inc., Pittsburgh, Pa.

**Microstat**—Thermostats. Friez Instrument Div., Bendix Aviation Corp. Towson, Md.

**Microtherm**—Thermostats. Barber-Colman Co., Rockford, Ill.

**Micro-Weld**—Spot welders. Micro Products Co., Chicago, Ill.

**Midget** — Radiation. Utica Radiator Corp., Utica, N. Y.

**Midget** — Regulators. Ohio Products Co., Cleveland, O.

**Mills**—Boilers. Smith Co., Inc., H. B. The, Westfield, Mass.

**Milvaco**—Air eliminators, floats, strainers, traps, valves. Milwaukee Valve Co., Milwaukee, Wis.

**Milwaukee**—Heaters. Blower Application Co., Milwaukee, Wis.

**Minfelt**—Insulation. Mitchell & Smith, Inc., Detroit, Mich.

**Minit Stoker**—Water heaters. Catskill Metal Works, Inc., Catskill, N. Y.

**Miracle Air**—Window ventilator units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

**Mir-O-Meter**—Combustion control systems. Bowser, Inc., Fort Wayne, Ind.

**Mirro-Matic**—Heaters. Handley Brown Heater Co., Jackson, Mich.

**Mirro-Shell**—Heaters. Handley Brown Heater Co., Jackson, Mich.

**Mixend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**MKayO** — Boilers. Mears-Kane-Ofeldt Inc., Philadelphia, Pa.

**Mobilene** — Gaskets. Johns-Manville New York, N. Y.

**Model Star**—Valves. Powell Co., Wm., Cincinnati, O.

**Moderator** — Heating system. Warren Webster Co., Camden, N. J.

**ModernAire**—Fans, unit air conditioners. Dallas Engineering Co., Inc., Dallas, Tex.

**Moduflow** — Control systems. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Modustat** — Valves. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Modutrol** — Heating systems. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Modutron** — Regulators. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Mogul**—Packing. Johns-Manville, New York, N. Y.

**Mogul**—Boiler cleaning compounds and water treatment. North American Fibre Products Co., The, Cleveland, O.

**Mohawk**—Pipe. Cohoes Rolling Mill Co., Cohoes, N. Y.

**Moisturator**—Humidifiers. Bridgeport Brass Co., Bridgeport, Conn.

**Moncrief** — Sheet metal pipe and fittings. Henry Furnace Co., The, Medina, O.

**Moncrief Hi - Capacity** — Furnaces. Henry Furnace Co., The, Medina, O.

**Monel**—Pipe fittings, pipe, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

**Mongol** — Pipe joint cement and compounds. Baer Bros., New York, N. Y.

**Monmouth**—Filters, humidifiers, valves. Cleveland Humidifier Co., Cleveland, O.

**Monobloc**—Centrifugal pumps. Worthington Pump & Machinery Corp., Harrison, N. J.

**Mono-Block**—Insulation. Baldwin-Hill Co., Trenton, N. J.

**Mono-Cast**—Pipe. American Cast Iron Pipe Co., Birmingham, Ala.

**Monoflo** — Hot water heating systems and fittings. Bell & Gossett Co., Morton Grove, Ill.

**Mono-Line**—Refractories. Quigley Co., Inc., New York, N. Y.

**Monsoon**—Fans, grilles, louvers. Jamieson Mfg. Co., Dallas, Texas.

**Morflex** — Flexible couplings. Morse Chain Co., Ithaca, N. Y.

**Mortairset**—Refractories. Walsh Refractories Corp., St. Louis, Mo.

**Mortex**—Protective coatings. Mortell Co., J. W., Kankakee, Ill.

**Mortite**—Caulking compounds, gaskets. Mortell Co., J. W., Kankakee, Ill.

**Motoco**—Gages, gage glasses, recorders, thermometers. Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.

**Moto-Merco**—Relays. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

**Motopump**—Pumps. Yeomans Bros. Co., Chicago, Ill.

**MotoReducer** — Speed reducers. Philadelphia Gear Works, Inc., Philadelphia, Pa.

**Motorstoker** — Stokers. Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.

**Motosteel**—Valves. Taylor Instrument Companies, Rochester, N. Y.

**Mototurb**—Ventilators. Uno Ventilator Co., Cliftondale, Mass.

**Muffletone**—Insulation. Celotex Corp., The, Chicago, Ill.

**Mullitex**—Refractories. Walsh Refractories Corp., St. Louis, Mo.

**Mult-Au-Matic**—Threading and boring machines. Bullard Co., The, Bridgeport, Conn.

**Multiblade**—Welding fume exhausters. General Blower Co., Chicago, Ill.

**Multiclone**—Dust collectors. Western Precipitation Corp., Los Angeles, Calif.

**Multi-Duty**—Air filters. American Air Filter Co., Inc., Louisville, Ky.

**Multiduty**—Pulleys and sheaves. Gates Rubber Co., The, Denver, Colo.

**Multifin**—Radiation. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Multiport**—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Multiseal**—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Multi-Seal**—Repair plugs. Rolyan Metal Products, Chicago, Ill.

**Multitherm** — Air conditioning units. Clarage Fan Co., Kalamazoo, Mich.

**Multi-V**—V-belts. Goodrich Co., B. F., Akron, O.

**Multivane**—Fans, blowers, unit heaters. B. F. Sturtevant Co., Boston, Mass.

**Multi-Vent**—Ceiling panels. Pyle-National Co., The, Chicago, Ill.

**Multi-Wash**—Dust collectors. Schneible Co., Claude B., Detroit, Mich.

**Murco** — Aftercoolers, cooling towers, heat exchangers, unit heaters. Murray Mfg. Co., D. J., Wausau, Wis.

**Murex**—Welding electrodes. Metal & Thermit Corp., New York, N. Y.

**Murray**—Radiation. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**N-M-D** — Valves. Lunkenheimer Co., Cincinnati, O.

**N-R**—Heat exchangers. National Radiator Co., The, Johnstown, Pa.

**NYBCo Steelfin**—Heating surface. New York Blower Co., Chicago, Ill.

**Nalco** — Boiler cleaning compounds, water treatment. National Aluminate Corp., Chicago, Ill.

**National**—Fans, furnaces, heaters. Magirl Foundry & Furnace Works, P. H., Bloomington, Ill.

**National** — Pumps. Austin-Mason Co., New York, N. Y.

**National Champion** — Air conditioning units, furnaces. Stainless & Steel Products Co , St. Paul, Minn.

**Naturzone**—Insulation. Wilson & Co., Chicago, Ill.

**Nelson**—Pumps. Haering Co., Inc., D. W., Chicago, Ill.

**Nelson**—Stokers. Heating Assurance, Inc., Spokane, Wash.

**Nemo** — Insulating cement. Smith & Kanzler Corp., Elizabeth, N. J.

**Neverust** — Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., Syracuse, N. Y.

**New Cyclone**—Dust collectors. Kirk & Blum Mfg. Co., Cincinnati, O.

**Neware**—Welding electrodes. Electric Arc, Inc., Newark, N. J.

**Niagara**—Meters. Buffalo Meter Co., Buffalo, N. Y.

**Nibco**—Fittings, joints, valves. Northern Indiana Brass Co., Elkhart, Ind.

**Nickelend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**No-Drip**—Insulation. Mortell Co., J. W., Kankakee, Ill.

**Non-clog**—Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

**Non-clog**—Pipe line strainers. Boylston Steam Specialty Co., Chicago, Ill.

**Non-Clogging** — Spray nozzles. Link-Belt Co., Chicago, Ill.

**Non-Con-Dux** — Cement, insulation. Wilson, Inc., Grant, Chicago, Ill.

**Non-Flash** — Brazing torches, welding and cutting apparatus. Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.

**Non-Frost** — Insulation. Keasbey & Mattison Co., Ambler, Pa.

**Non-Sweat** — Insulation. Keasbey & Mattison Co., Ambler, Pa.

**No-Ox-Id**—Protective coatings. Dearborn Chemical Co., Chicago, Ill.

**Norblo**—Dust collectors, fans, washers. Northern Blower Co., Cleveland, O.

**Nordstrom**—Valves. Merco-Nordstrom Valve Co., Pittsburgh, Pa.

**No-Rivet**—Regulators. Ohio Products Co., Cleveland, O.

**Northwind**—Unit air coolers. Pleasantaire Corp. of America, Washington, D. C.

**Norwesco** — Cement and compounds, boiler and radiator sealing compounds. Atlas Chemical Co., Marietta, O.

**No-Site**—Louvers and shutters. Waterloo Register Co., Waterloo, Ia.

**No Streak** — Registers. Rock Island Register Co., Rock Island, Ill.

**No-Vent**—Pumps. Stout & Sons, David, St. Louis, Mo.

**No-Ve-U**—Door ventilators. Waterloo Register Co., Waterloo, Ia.

**Novoid**—Insulation. Cork Import Corp., New York, N. Y.

**Novus**—Boilers. National Radiator Co., The, Johnstown, Pa.

**Nu-Air**—Air conditioning units. American Metal Products Co., Fort Worth, Texas.

**Nu-Air**—Fans, window ventilator units. Meier Electric & Machine Co., Indianapolis, Ind.

**Nu-Air**—Ventilators. Milcor Steel Co., Milwaukee, Wis.

**Nu-Alpina** — Ventilators. Milcor Steel Co., Milwaukee, Wis.

**Nudry**—Cement. Pyrolite Products Co., Cleveland, O.

**Nu-Grip**—Shears and snips. Wiss and Sons Co., J., Newark, N. J.

**Nu-Notch** — Mushroom ventilators. Knowles Mushroom Ventilator Co., Montclair, N. J.

**Nuvent**—Ventilators. Aeolus Dickinson, Chicago, Ill.

**Nu-Wood** — Insulation. Wood Conversion Co., St. Paul, Minn.

**OB**—Valves. Ohio Brass Co., Mansfield, O.

**O.E.F.** — Preheaters, water heaters. Frank Heaters, Inc., Paterson, N. J.

**OK**—Motors. Marathon Electric Mfg. Corp., Wausau, Wis.

**OK**—Stocks and dies. Greenfield Tap & Die Corp., Greenfield, Mass.

**OPW**—Valves. Ohio Pattern Works & Foundry Co., Cincinnati, O.

**Oakwood**—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

**Octopus** — Welding fume collectors. Chelsea Fan & Blower Co., Inc., Irvington, N. J.

**Ofeldt**—Boilers, superheaters. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

**Oilbuster**—Boiler cleaning compounds. Cannon Chemical Co., Everett, Mass.

**Oil-O-Matic** — Oil burners. Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

**Okay Tred**—Leather belting. Houghton & Co., E. F., Philadelphia, Pa.

**Ol' Faithful** — Humidifiers. Maid-O'-Mist, Inc., Chicago, Ill.

**One Venturi** — Heating systems. Taco Heaters, Inc., New York, N. Y.

**Orangeburg** — Fiber pipe. Fibre Conduit Co., Orangeburg, N. Y.

**Oriflex** — Valves. Dunham Co., C. A. Chicago, Ill.

**Oswego**—Cutters, punches, wrenches. International Nutyp Tool Co., Oswego, N. Y.

**Ovaltube**—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Oxweld**—Welding rod, welding and cutting apparatus. Linde Air Products Co., The, New York, N. Y.

**Ozite**—Insulation. American Hair & Felt Co., Chicago, Ill.

**PC**—Air conditioning units. Buffalo Forge Co., Buffalo, N. Y.

**PDQC** — Pipe machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

**P & H**—Welding electrodes. Harnischfeger Corp., Milwaukee, Wis.

**P & H Hansen**—Arc Welders. Harnischfeger Corp., Milwaukee, Wis.

**P. I. V. Gear**—Speed changers. Link-Belt Co., Philadelphia, Pa.

**PTP**—Pipe fittings, steel tubing. Pipe & Tube Products, Inc., Jersey City, N. J.

**Paintgrip** — Sheets. American Rolling Mill Co., The, Middletown, O.

**Palco**—Packing. Greene, Tweed & Co. New York, N. Y.

**Palco Wool-Saferized**—Insulation. Pacific Lumber Co., The, San Francisco Calif.

**Palmaire**—Unit heaters. Palmer Mfg Corp., Phoenix, Ariz.

**Palmetto**—Packing. Greene, Tweed & Co., New York, N. Y.

**Palmetto Supersheat** — Gaskets and packing. Greene, Tweed & Co., New York, N. Y.

**Par** — Condensing units. Lynch Mfg Corp., Defiance, O.

**Paracoil**—Coils, condensers, heaters, oil coolers, preheaters, steam traps valves, water chillers. Davis Engineering Corp., Elizabeth, N. J.

**Paraline**—Motor bases. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Parasol**—Spray nozzles. Spraying Systems Co., Chicago, Ill.

**Parko**—Psychrometers. Parks-Cramer Co., Fitchburg, Mass.

**Pathfinder**—Belting. Goodyear Tire & Rubber Co., Akron, O.

**Pax-Tite**—Leather packing. Watson-Stillman Co., Roselle, N. J.

**Peer**—Welders. Pier Equipment Mfg Co., Benton Harbor, Mich.

**Peerless** — Humidifiers, air washers New York Blower Co., Chicago, Ill

**Peerless** — Pipe machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

**Penco**—Plastic fittings, pipe and tubing. North Penn Co., New York, N. Y

**Penn-M-Co**—Fittings. Penn Mfg. Corp of Washington, Pa., Washington, Pa

**Perco-Flash**—Water heaters. Kresne-Stamm Mfg. Co., New York, N. Y.

**Perfection** — Electrodes. Carlin Co Anthony, Cleveland, O.

**Perfection**—Plates. Beaton & Cadwell Mfg. Co., New Britain, Conn.

**Perfection**—Valves. American District Steam Co., North Tonawanda, N. Y.

**Permo-Aire**—Filters. Air Devices, Inc New York, N. Y.

**Permo-Aire** — Filters. Badger Corp Milwaukee, Wis.

**Petro**—Oil burners, water heaters. Petroleum Heat & Power Co., Stamford, Conn.

**Pexto** — Brakes, punches, shears wrenches. Peck, Stow & Wilcox Co Southington, Conn.

**Pierce-Firebox** — Boilers. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

**Pilot**—Motors. Smith Mfg. Co., Inc F A., Rochester, N. Y.

**Pilot**—Valves. Powell Co., Wm., Cincinnati, O.

**Pipe Master** — Pipe cutting machines Oster Mfg. Co., Cleveland, O.

**Pipemaster**—Wrenches. Erie Tool Wks Erie, Pa.

**Pitco** — Unions. Pittsburgh Valve & Fittings Corp., Barberton, O.

**Pittsburgh** — Radiator, unit heaters Automatic Gas Equipment Co., Pittsburgh, Pa.

**Pittsburgh-National** — Meters. Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

**Plasti-Calk** — Caulking compounds Chamberlin Metal Weather Strip Co Detroit, Mich.

**Plastikon**—Caulking compounds. Goodrich Co., B. F., Akron, O.

**Plastiseal** — Cement and Compounds Goetze Gasket & Packing Co., Inc. New Brunswick, N. J.

**Plastite** — Caulking compounds. U. S Stoneware Co., New York, N. Y.

**Plastoid**—Caulking compounds, furnace cement. Plastic Products Co., Detroit, Mich.

**Playford**—Stokers. Rosedale Foundry & Machine Co., Pittsburgh, Pa.

**Plexifin**—Unit heaters. Bayley Blower Co., Milwaukee, Wis.

**Plexiform**—Fans. Bayley Blower Co., Milwaukee, Wis.

**Plìatube** — Plastic pipe and tubing. Carter Products Corp., Cleveland, O.

**Plicast**—Refractories. Plibrico Jointless Firebrick Co., Chicago, Ill.

**Plisulate**—Insulating cement. Plibrico Jointless Firebrick Co., Chicago, Ill.

**Plumrite**—Pipe. Bridgeport Brass Co., Bridgeport, Conn.

**Plymouth**—Stokers. Clizbe Bros. Mfg. Co., Plymouth, Ind.

**Ply-Tech**—Plywood sheets and board. Technical Ply-Woods, Chicago, Ill.

**Pneumatronic** — Electronic and pneumatic temperature control equipment. Johnson Service Co., Milwaukee, Wis.

**Poeco** — Insulation. Poe Co., C. W., Cleveland, O.

**Polartron**—Relays, regulators, switches. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

**Porex**—Porous metal. General Motors Corp., Moraine Products Div., Dayton, O.

**Poro-Stone**—Filters. Adams Co., R. P., Buffalo, N. Y.

**Porto-Power** — Pipe benders. Blackhawk Mfg. Co., Milwaukee, Wis.

**Pottstown**—Pumps. Allen Billmyre Co., Mamaroneck, N. Y.

**Power**—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

**Power Boy**—Pipe cutting and threading machines. Oster Mfg. Co., Cleveland, O.

**Powerflex** — Flat belt drives. Gates Rubber Co., The, Denver, Colo.

**Power-Flex**—Stokers. Link-Belt Co., Chicago, Ill.

**Power Master** — Boilers. Orr & Sembower, Inc., Reading, Pa.

**Power Pak**—Boilers. Orr & Sembower, Inc., Reading, Pa.

**Precipitron** — Air cleaners. Westinghouse Electric & Mfg. Co., Cleveland, O.

**Premier**—Boilers, heaters. National Radiator Co., The Johnstown, Pa.

**Premier**—Welding rod. American Steel & Wire Co., Cleveland, O.

**Pre-Notch** — Ducts and duct fittings. Gray Metal Products, Inc., Rochester, N. Y.

**Pressuretrol** — Regulators, switches. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

**Prestal** — Pipe benders. Tal's Prestal Bender, Inc., Milwaukee, Wis.

**Prestico**—Caulking compounds, furnace cement. Presstite Engineering Co., St. Louis, Mo.

**Prest-O-Lite**—Leak detectors, torches. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

**Prest-O-Weld** — Welding and cutting apparatus. Linde Air Products Co., The, New York, N. Y.

**Princo**—Anemometers, gages, hygrometers, manometers, psychrometers, regulators, relays, thermometers, thermostats. Precision Thermometer and Instrument Co., Philadelphia, Pa.

**Probestos**—Gasket. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Protectomotor** — Air filters. Dollinger Corp., Rochester, N. Y.

**Protectorelay** — Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Protectoring**—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Proxlin**—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

**Pryzoak** — Belting. Graton & Knight Co., Worcester, Mass.

**Pul-Air**—Ventilators. Lyon, Conklin & Co., Inc., Baltimore, Md.

**Pulling**—Circulators, pumps. Columbus Steam Pump Works Co., Columbus, O.

**Pulverzone**—Stokers. American Coal Burner Co., Chicago, Ill.

**Punkah**—Louvers and shutters. Kelvin-White Co., Boston, Mass.

**Purox**—Electrodes, welding and cutting apparatus. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

**Pyralux**—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.

**Pyrex** — Glass pipe, gage and sight glasses, heat exchangers, nozzles. Corning Glass Wks., Corning, N. Y.

**Pyro**—Thermometers, recorders, regulators. Pyrometer Instrument Co., New York, N. Y.

**Pyrofelt**—Insulation. Mitchell & Smith, Inc., Detroit, Mich.

**Pyroment**—Cement. Keasbey & Mattison Co., Ambler, Pa.

**Pyrotron**—Recorders. Bailey Meter Co., Cleveland, O.

**Q-Chromastic** — Refractories. Quigley Co., Inc., New York, N. Y.

**Q-Chrome**—Refractories. Quigley Co., Inc., New York, N. Y.

**QD**—Sheaves. Worthington Pump & Machinery Corp., Harrison, N. J.

**Q-Seal**—Caulking compounds. Quigley Co., Inc., New York, N. Y.

**Q-T**—Insulation. Celotex Corp., The, Chicago, Ill.

**QT**—Unit heaters. Kisco Boiler & Engineering Co., St. Louis, Mo.

**Quad**—Cooling towers. Young Radiator Co., Racine, Wis.

**Quad**—Fans. Trade-Wind Motorfans, Inc., Los Angeles, Calif.

**Quartzoid**—Sprinkler heads. Grinnell Co., Inc., Providence, R. I.

**Quiet May**—Oil burners. May Oil Burner Corp., Baltimore, Md.

**Quiet Zone**—Blower wheels, fans. Palmer's Mfg. Corp., Phoenix, Ariz.

**Quilt**—Insulation. Cabot, Inc., Samuel, Boston, Mass.

**Quintuplet**—Valves. Maid-O'-Mist, Inc., Chicago, Ill.

**RBC**—Roller bearings. Roller Bearing Co. of America, Trenton, N. J.

**RB Pressure**—Pressure blowers. Western Blower Co., Seattle, Wash.

**R & G**—Grilles, registers. Register & Grille Mfg. Co., Brooklyn, N. Y.

**R. I. 250**—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

**R-K**—Combustion control systems, regulators, valves. Ruggles-Klingemann Mfg. Co., Salem, Mass.

**R & M**—Motors. Robbins & Myers, Inc., Springfield, O.

**R & M Moyno**—Pumps. Robbins & Myers, Inc., Springfield, O.

**R-P Zeolite**—Water tratment. Research Products Corp., Madison, Wis.

**R. P. & C.**—Fittings, valves. Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Bridgeport, Conn.

**R-U-F**—Fans. Reed Unit-Fans, Inc., New Orleans, La.

**Race**—Fans, heaters. Royal Air Conditioning Equipment Co., Alhambra, Calif.

**Radial**—Unit heaters. McQuay, Inc., Minneapolis, Minn.

**Radialflow**—Valves. Smolensky Valve Co., Inc., Bedford, O.

**Radiatherm**—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

**Radi-Ion**—Ionization apparatus. Montgomery Bros., San Francisco, Calif.

**Radolite**—Cement, refractories. Pyrolite Products Co., Cleveland, O.

**Raintite** — Ventilators. Aeolus Dickinson, Chicago, Ill.

**Rajah**—Packing. Johns-Manville, New York, N. Y.

**Ramapo**—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

**Ranarex**—Analyzers, indicators, recorders. Permutit Co., New York, N. Y.

**Rapid**—Oil coolers. Bell & Gossett Co., Morton Grove, Ill.

**Rapiduction** — Pipe cutting machines. Oster Mfg. Co., Cleveland, O.

**Rawl-Anchor** — Bolts. Rawlplug Co., Inc., The, New York, N. Y.

**Rawldrill**—Drills for masonry. Rawlplug Co., Inc., The, New York, N. Y.

**Rawl-Drive**—Bolts. Rawlplug Co., Inc., The, New York, N. Y.

**Rawl-Taper**—Bolts. Rawlplug Co., Inc., The, New York, N. Y.

**Raydiant**—Radiation. Weil-McLain Co., Chicago, Ill.

**Reco**—Accumulators, condensers, headers, heaters, preheaters, tanks, unit coolers. Richmond Engineering Co., Richmond, Va.

**Reco**—Controllers and starters, motors. Reynolds Electric Co., Chicago, Ill.

**Reco Radi-Aire**—Fans. Reynolds Electric Co., Chicago, Ill.

**Record-O-Stat** — Recorder - Controllers. Johnson Service Co., Milwaukee, Wis.

**Recoy**—Chillers, condensers, cooling surface, unit air conditioners and coolers. Refrigeration Economics Co., Inc., Canton, O.

**Red**—Operators, regulators, switches, valves. Cooper Co., Clark, Palmyra, N. J.

**Red Devil** — Furnace and pipe joint cement. Pecora Paint Co., Philadelphia, Pa.

**Red Diamond**—Pipe. American District Steam Co., North Tonawanda, N. Y.

**Red Flash**—Traps. Ellis Drier Co., Chicago, Ill.

**Red Head**—Tongs. Billings & Spencer Co., Hartford, Conn.

**Red Head**—Traps. Ellis Drier Co., Chicago, Ill.

**Red-Reading-Mercury** — Hygrometers, psychrometers, thermometers. Palmer Co., Cincinnati, O.

**Red Socket**—Wrenches. Lowell Wrench Co., Worcester, Mass.

**Red Top** — Humidistats, thermostats. H-B Instrument Co., Philadelphia, Pa.

**Red Top**—Valves. Neptune Meter Co., New York, N. Y.

**Red Top**—Insulation. United States Gypsum Co., Chicago, Ill.

**Redi**—Stokers. General Machinery Co., Spokane, Wash.

**Redi-Return**—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

**Redi-Vac** — Pumps. American - Marsh Pumps, Inc., Battle Creek, Mich.

**Reformend**—Electrodes. Arcos Corp., Philadelphia, Pa.

**Refrak Screen** — Gas burners. Selas Corp. of America, Philadelphia, Pa.

**Rego**—Welding and cutting apparatus. Universal Power Corp., Cleveland, O.

**Rego**—Torches, welding and cutting apparatus. National Cylinder Gas Co., Chicago, Ill.

**Relatrol**—Heating systems. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

**Reliance**—Regulators. American Meter Co., Inc., New York, N. Y.

**Renewo** — Valves. Lunkenheimer Co., Cincinnati, O.

**Renu-Vent**—Air filters. American Air Filter Co., Inc., Louisville, Ky.

**Research**—Belting. Graton & Knight Co., Worcester, Mass.

**Reverbolite**—Insulation. Celotex Corp., The, Chicago, Ill.

**Revolute**—Blueprint machines. Paragon-Revolute Corp., Rochester, N. Y.

**Rex**—Blower wheels, fans. Air Controls, Inc., Cleveland, O.

**Rex**—Chain drives, coal and ash conveyors, couplings, nozzles, pillow blocks, pumps. Chain Belt Co., Milwaukee, Wis.

**Rex-AC**—Bearings. Air Controls, Inc., Cleveland, O.

**Rex-Airate**—Roof ventilators, blower wheels. Air Controls, Inc., Cleveland, O.

**Rex-Flex**—Ducts. Chicago Metal Hose Corp., Maywood, Ill.

**Rexoil**—Burners, heaters. Reif-Rexoil, Inc., Buffalo, N. Y.

**Rex-Tube**—Duct connections. Chicago Metal Hose Corp., Maywood, Ill.

**Rexvane**—Fans. Sturtevant Co., B. F., Boston, Mass.

**Rex-Weld**—Hose, pipe joints. Chicago Metal Hose Corp., Maywood, Ill.

**Reyn-O-Cell** — Insulation. Reynolds Metals Co., Richmond, Va.

**Rhino**—Caulking compounds. Pecora Paint Co., Philadelphia, Pa.

**Richvar**—Radiation. Richmond Radiator Co., Gas Products Div., Uniontown, Pa.

**Ridgid**—Pipe machines, wrenches, cutters, vises. Ridge Tool Co., Elyria, O.

**Rid-Sludge**—Cleaning compounds, corrosion treatment. Apex All Weather Products, Chicago, Ill.

**Rifco 300**—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

**Rihco**—Humidifiers. Rhode Island Humidifier & Ventilating Co., Boston, Mass.

**Rip-Clean**—Filters. Research Products Corp., Madison, Wis.

**Rip-pl**—Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

**Ripple-Fin**—Cooling and heating surface. McQuay, Inc., Minneapolis, Minn.

**Robinson**—Brakes, punches. New Albany Machine Mfg. Co., New Albany, Ind.

**Rocan**—Copper sheets. Revere Copper and Brass, Incorporated, New York, N. Y.

**Rocktex**—Insulation. Carey Mfg. Co., Philip, Lockland, Cincinnati, O.

**Rocop**—Heaters. Rome-Turney Radiator Co., Rome, N. Y.

**Rodpax**—Packing. National Engineering Products, Inc., Washington, D. C.

**Ro-Flo** — Compressors. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Rolagrip** — Couplings. Gustin Bacon Mfg. Co., Kansas City, Mo.

**Roman Bronze** — Welding rod. Revere Copper and Brass Incorporated, New York, N. Y.

**Roofvane**—Ventilators. Sturtevant Co., B. F., Boston, Mass.

**Roof-Vent** — Ventilators. Reed Unit-Fans, Inc., New Orleans, La.

**Rotameter**—Flow meters. Schutte & Koerting Co., Philadelphia, Pa.

**Rotameter**—Meters. Fischer & Porter Co., Hatboro, Pa.

**Rota-Roll** — Pumps. Sundstrand Machine Tool Co., Pump Div., Rockford, Ill.

**Roto Blast**—Furnaces. Moncrief Furnace Co., Atlanta, Ga.

**Roto-Clone**—Dust collectors. American Air Filter Co., Inc., Louisville, Ky.

**Rotohood**—Ventilators. Uno Ventilator Co., Cliftondale, Mass.

**Rotojet** — Spray nozzles. Binks Mfg. Co., Chicago, Ill.

**Roto-louvre** — Dryers. Link-Belt Co., Chicago, Ill.

**Roto-trol**—Liquid pressure regulators and switches. Healy Ruff Co., St. Paul, Minn.

**Ro-Twin**—Air compressors. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Roxite**—Pipe. United States Stoneware Co., New York, N. Y.

**Rubalt**—Enamels and lacquers. Hague & Co., Inc., Alfred, Brooklyn, N. Y.

**Rubatex**—Insulation. Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.

**Rubyfluid**—Solder. Ruby Chemical Co., Columbus, O.

**Runwel**—Packing. Greene, Tweed & Co., New York, N. Y.

**Rusco**—Insulation. Russell Co., F. C., Cleveland, O.

**Rustbuster**—Cleaning compounds. Cannon Chemical Co., Everett, Mass.

**S-A**—Feeders. Stephens-Adamson Mfg. Co., Aurora, Ill.

**SA**—Valves. Lunkenheimer Co., Cincinnati, O.

**S. C.**—Air heaters, gas burners. Surface Combustion, Toledo, O.

**S-N**—Air conditioning units, burners, fans, heaters, pumps, stokers. Scott-Newcomb, Inc., St. Louis, Mo.

**S & P**—Burners, governors, preheaters, regulators, strainers, valves. Staples & Pfeiffer, San Francisco, Calif.

**S. R. P.**—Protective coatings. Sonneborn Sons, Inc., L., New York, N. Y.

**Saco**—Speed reducers. Stephens-Adamson Mfg. Co., Aurora, Ill.

**Saf-Dry**—Refrigerants. Liquid Carbonic Corp., The, Chicago, Ill.

**Sal-Mo**—Cement, insulation, packing. Sall Mountain Co., Chicago, Ill.

**Sanidaire** — Humidifiers. United States Air Conditioning Corp., Minneapolis, Minn.

**Santocel**—Insulation. Monsanto Chemical Co., Merimac Div., Everett, Mass.

**Santosite**—Water treatment. Monsanto Chemical Co., St. Louis, Mo.

**Santrol**—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Saran**—Plastic pipe and tubing. Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.

**Saran** — Plastic fittings and tubing. Hodgman Rubber Co., Framingham, Mass.

**Saran**—Plastic pipe and heating tubing. Skuttle Mfg. Co., Detroit, Mich.

**Saunders** — Pipe cutters. Erie Tool Works, Erie, Pa.

**Sauter**—Time switches. Cramer Co., Inc., R. W., The, Centerbrook, Conn.

**Schwan**—Gas burners. Jamieson Mfg. Co., Dallas, Texas.

**Scotch Giant**—Refrigerating compressors. General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.

**Scroll-Pivoter**—Shears. Wiss & Sons Co., J., Newark, N. J.

**Scru-peller** — Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

**Seal Master**—Bearings. Stephens-Adamson Mfg. Co., Aurora, Ill.

**Seal-Less** — Compressors. Westinghouse Electric & Mfg. Co., Springfield, Mass.

**Seal-Rite** — Cement and compounds. Macksons Co., New York, N. Y.

**Searchray** — X-ray machines. North American Philips Co., Inc., New York, N. Y.

**Security** — Caulking compounds. National Mfg. Corp., Tonawanda, N. Y.

**Segweld**—Pipe fittings. Gustin Bacon Mfg. Co., Kansas City, Mo.

**Seigelite** — Gaskets. Johns-Manville, New York, N. Y.

**Seismo-Dampers**—Bases. Korfund Co., Long Island City, N. Y.

**Selectair**—Air conditioning units. Johnson Co., S. T., Oakland, Calif.

**Sells**—Bearings. Royersford Foundry & Machine Co., Royersford, Pa.

**Sensatherm** — Thermostats. Mercoid Corp., Chicago, Ill.

**Sensitrol** — Relays. Weston Electrical Instrument Corp., Newark, N. J.

**Sentinel**—Pumps. Red Jacket Mfg. Co., Davenport, Ia.

**Sentry**—Smoke alarms. Boiler Room Equipment, Inc., New York, N. Y.

**Serrabestos**—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Service**—Packing. Johns-Manville, New York, N. Y.

**Serviron**—Coatings. Saverite Engineering Co., Hoboken, N. J.

**Sesure** — Gages. Yarnall-Waring Co., Philadelphia, Pa.

**"77"** — Pipe coverings. Eagle-Picher Lead Co., Cincinnati, O.

**"78"**—Traps. Webster & Co., Warren, Camden, N. J.

**Shawco**—Bends, headers. Shaw Co., Benjamin F., Wilmington, Del.

**Sheetrock**—Sheets and board for ducts. United States Gypsum Co., Chicago, Ill.

**Shelby** — Tubing. National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.

**Shield-Arc** — Electrodes, arc welders. Lincoln Electric Co., Cleveland, O.

**Shone**—Sewage ejectors. Yeomans Bros. Co., Chicago, Ill.

**Shut-O-Vent** — Louvers and shutters. Reed Unit-Fans, Inc., New Orleans, La.

**Silent Air** — Fans. Belanger Fan & Blower Co., Detroit, Mich.

**Silentaire** — Window ventilator units. Berger Mfg. Div., Republic Steel Corp., Canton, O.

**Silentblu**—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Silentvane** — Fans. Sturtevant Co., B. F., Boston, Mass.

**Sil-Fos**—Solder. Handy & Harman, New York, N. Y.

**Silicair**—Insulation. Western Silicair Products, Inc., Burbank, Calif.

**Silverlink**—Chain drives. Link-Belt Co., Indianapolis, Ind.

**Silverseal**—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Silverstreak** — Chain drive. Link-Belt Co., Indianapolis, Ind.

**Silver Stream**—Spray nozzles. Skinner Irrigation Co., Troy, O.

**Silvertop**—Eliminators, traps. Anderson Co., V. D., The, Cleveland, O.

**Simplex** — Gages. Viking Pump Co., Cedar Falls, Ia.

**Simplex**—Pipe vises. Desmond-Stephan Mfg. Co., Urbana, O.

**Simplex** — Regulators. Ohio Products Co., Cleveland, O.

**Simplex** — Regulators, tanks. Bell & Gossett Co., Morton Grove, Ill.

**Sim-Trol**—Controls. Simplex Mfg. Co., Fond du Lac, Wis.

**Sirocco**—Blowers, dust collectors, fans, unit air conditioners, unit air coolers, unit air humidifiers, air washers. American Blower Corp., Detroit, Mich.

**Skil Drill**—Drills. Skilsaw, Inc., Chicago, Ill.

**Skip-Tooth**—Dies. Nye Tool & Machine Co., Chicago, Ill.

**Slugin**—Bolts. Star Expansion Bolt Co., New York, N. Y.

**Smith-Dolan**—Electric preheaters and stress relievers. Electric Arc, Inc., Newark, N. J.

**Smith-Midget**—Direct radiation. Smith Co., Inc., H. B., Westfield, Mass.

**Smith-Mills** — Boilers. Smith Co., Inc., H. B., Westfield, Mass.

**Snapin** — Bolts. Star Expansion Bolt Co., New York, N. Y.

**Snap-Rite** — Ducts and duct fittings. Gray Metal Products, Inc., Rochester, N. Y.

**Sno-Breze** — Air conditioning units, cooling surface. Palmer Mfg. Corp., Phoenix, Ariz.

**Snug**—Radiation. Weil-McLain Co., Chicago, Ill.

**Softweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Solray** — Radiation. Weil-McLain Co., Chicago, Ill.

**Sol-vet** — Cleaning compounds, water treatment. Anderson - Stolz Corp., Kansas City, Mo.

**Sono-O-Seal**—Insulation. General Insulating Products Co., Brooklyn, N. Y.

**Soundliner** — Insulation. Baldwin - Hill Co., Trenton, N. J.

**Sovereign**—Packing. Darcoid Co., Inc., New York, N. Y.

**Special X**—Solder. Industrial Service Laboratories, Milwaukee, Wis.

**Speed-Flex**—Flat belt drives. Gates Rubber Co., The, Denver, Colo.

**Speed Heater**—Unit heaters. Sturtevant Co., B. F., Boston, Mass.

**Speed Nuts** — Locknuts. Tinnerman Products, Inc., Cleveland, O.

**Speedarc**—Electrodes. Universal Power Corp., Cleveland, O.

**Sphero**—Plug valves. Fairbanks Co., New York, N. Y.

**Spider Web**—Air filters. Wilson & Co., Chicago, Ill.

**Spiradome**—Spray nozzles. Fluor Corp., Ltd., The, Los Angeles, Calif.

**Spiralwound**—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Spiro**—Heaters. Stout & Sons, David, St. Louis, Mo.

**Spirodome** — Spray nozzles. Cooling Tower Co., Inc., The, Div. of the Fluor Corp., Ltd., New York, N. Y.

**Spirotallic** — Gaskets. Johns-Manville, New York, N. Y.

**Spirovane**—Fans. Western Blower Co., Seattle, Wash.

**Spraco**—Nozzles, separators, strainers, washers. Spray Engineering Co., Somerville, Mass.

**Spra-Rite** — Nozzles. Binks Mfg. Co. Chicago, Ill.

**Spray-Acoustic** — Insulation. Sprayo-Flake Co., Chicago, Ill.

**Springin**—Bolts. Star Expansion Bolt Co., New York, N. Y.

**Stabilflo** — Valves. Foxboro Co., Foxboro, Mass.

**Stacon** — Regulators, valves. Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.

**Sta-Gloss**—Steel sheets. Jessop Steel Co., Washington, Pa.

**Staidarc**—Electrodes. Universal Power Corp., Cleveland, O.

**Stainarc**—Electrodes. Universal Power Corp., Cleveland, O.

**Stainlend** — Electrodes. Arcos Corp., Philadelphia, Pa.

**Stainless** — Cement and compounds. Grinnell Co., Inc., Providence, R. I.

**Stainweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Standforated**—Grilles. Standard Stamping & Perforating Co., Chicago, Ill.

**Star**—Ventilators. Merchant & Evans Co., Philadelphia, Pa.

**Staxauster** — Roof ventilators. Allen Corp., Detroit, Mich.

**Staynew**—Filters. Dollinger Corp., Rochester, N. Y.

**Stazin**—Bolts. Star Expansion Bolt Co., New York, N. Y.

**Steelok** — Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Sterilamp**—Lamps. Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

**Sterlco**—Controls, eliminators, pumps, strainers, heating systems, traps, valves. Sterling, Inc., Milwaukee, Wis.

**Sterling** — Compressors, condensers, valves. Reynolds Mfg. Co., Inc., Springfield, Mo.

**Stictite**—Cement. Refractory & Insulation Corp., New York, N. Y.

**Stokerator—Stokers. Northern Steel &** Stoker Corp., Peoria, Ill.

**Stokerelay**—Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Stokol**—Stokers, water heaters. Schwitzer-Cummins Co., Indianapolis, Ind.

**Streamaire** — Unit heaters, radiation, cooling surface. Young Radiator Co., Racine, Wis.

**Steamjet** — Spray nozzles. Spraying Systems Co., Chicago, Ill.

**Streamline**—Couplings, cutters, fittings, heat exchangers, manifolds, nipples, pipe, strainers, tubing, unions, valves. Mueller Brass Co., Port Huron, Mich.

**Striatube** — Plastic pipe and tubing. Carter Products Corp., Cleveland, O.

**Stronghold**—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

**Stud-Pak** — Insulation. United States Mineral Wool Co., Chicago, Ill.

**Sturdybender**—Power brakes. Bath Co., Cyril J., The, Cleveland, O.

**Submersion** — Boilers, water heaters Stout & Sons, David, St. Louis, Mo.

**Sullarc** — Electrodes. Universal Power Corp., Cleveland, O.

**Sunray** — Boilers, radiation. United States Radiator Corp., Detroit, Mich.

**Super Air Screws** — Fans. Marathon Electric Mfg. Corp., Wausau, Wis.

**Super Cold Fin** — Cooling surface. Rempe Co., Chicago, Ill.

**Super Seal**—Fittings. Grinnell Co., Inc., Providence, R. I.

**Super "66"** — Insulation. Eagle-Picher Lead Co., Cincinnati, O.

**Super 7**—V belts. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Super Silvertop**—Traps. Anderson Co., V. D., The, Cleveland, O.

**Super Thermo Stucco**—Cement. Chicago Fire Brick Co., Chicago, Ill.

**Super X** — Copper sheets. Western Brass Mill Div., Olin Industries, Inc., East Alton, Ill.

**Super X**—Coatings. Nelson Mfg. Co., B. F., Minneapolis, Minn.

**Supercord**—V belts. Browning Mfg. Co., Inc., Maysville, Ky.

**Supercutno**—Packing. Greene, Tweed & Co., New York, N. Y.

**Super-deLavaud**—Pipe. U. S. Pipe & Foundry Co., Burlington, N. J.

**Superector**—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Superex** — Insulation. Johns-Manville, New York, N. Y.

**Super-Fan**—Fan blades. Norwin Co., Freeport, Ill.

**Superflex** — Drives. Gates Rubber Co., The, Denver, Colo.

**Superflux**—Solder. Lewis Laboratories, Inc., Paul, Milwaukee, Wis.

**Superheat**—Gas burners. Selàs Corp. of America, Philadelphia, Pa.

**Superior**—Fans. American Foundry & Furnace Co., Bloomington, Ill.

**Superior** — Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Superjustable** — Adjustable wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Super-Power**—Drives. Baldwin Belting, Inc., New York, N. Y.

**Superratchet**—Ratchet Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Superrench**—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Super-S**—Gages. Klingerit, Inc., New York, N. Y.

**Supersocket**—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

**Supertan**—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

**Supertemp** — Insulation. Eagle-Picher Lead Co., Cincinnati, O.

**Supertherm**—Systems. Ross Engineering Corp., J. O., New York, N. Y.

**Sure Return** — Condensation return pumps. Chicago Pump Co., Chicago, Ill.

**Surevent** — Valves. Gorton Heating Corp., Cranford, N. J.

**Sureweld**—Electrodes. National Cylinder Gas Co., Chicago, Ill.

**Surlock**—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

**Sweet's**—Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

**Swendeman**—Air separators. Leavitt Machine Co., Orange, Mass.

**Sylphon** — Bellows, joints, operators, regulators, valves. Fulton Sylphon Co., Knoxville, Tenn.

**Sylphon**—Traps, valves. Webster & Co., Warren, Camden, N. J.

**Synchro-Lectric**—Viscosimeters. Brookfield Engineering Laboratories, Sharon, Mass.

**Synchro-Meter**—Meters. Bailey Meter Co., Cleveland, O.

**Synchron** — Motors. Hansen Mfg. Co., Inc., Princeton, Ind.

**Synchrotie** — Recorders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Syncretizer**—Unit ventilators. Nesbitt, Inc., John J., Philadelphia, Pa.

**Syphonaire**—Ventilators. Western Engineering & Mfg. Co., Los Angeles, Calif.

**T.T.**—Smoke guns. Hill, E. Vernon, Chicago, Ill.

**Tabasco** — Water heaters. Kewanee Boiler Corp., Kewanee, Ill.

**Tag**—Humidistats, hygrometers, manometers, meters, psychrometers, recorders, regulators, thermometers, traps, valves. Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.

**Tampico** — Air filters. Chicago Filter Co., Joliet, Ill.

**Tampin** — Bolts. Star Expansion Bolt Co., New York, N. Y.

**Tank-O-Meter**—Gages. Uehling Instrument Co., Paterson, N. J.

**Tanktrol**—Regulators. Automatic Control Co., St. Paul, Minn.

**Tannate**—Belting, packing. Rhoads & Sons, J. E., Philadelphia, Pa.

**Tanseal**—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Techni-Louvre**—Vanes. Waterloo Register Co., Waterloo, Ia.

**Techni-Trol**—Dampers. Waterloo Register Co., Waterloo, Ia.

**Techni-Turn**—Vanes. Waterloo Register Co., Waterloo, Ia.

**Teksag Colloid** — Boiler compounds. American Teksag Products Co., Inc., Mount Vernon, N. Y.

**Televisor**—Gages. Schutte & Koerting Co., Philadelphia, Pa.

**Tellevel**—Switches. Stephens-Adamson Mfg. Co., Aurora, Ill.

**Teltru**—Anemometers, gages. Hill, E. Vernon, Chicago, Ill.

**Tem-Clock (Electric)**—Time switches. Penn Electric Switch Co., Goshen, Ind.

**Temlok**—Insulation. Armstrong Cork Co., Lancaster, Pa.

**Temperator** — Unit air conditioners. Dunham Co., C. A., Chicago, Ill.

**Tempryte** — Windows. Truscon Steel Co., Youngstown, O.

**Temtrol** — Thermostats. Penn Electric Switch Co., Goshen, Ind.

**Tensulate**—Cement, insulation. Tennessee Products Corp., Nashville, Tenn.

**Texrope** — V-belt drives, pulleys, v-belts. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Texslide**—Motor bases. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Tharco**—Cement. The Armstrong Co., Detroit, Mich.

**Thawzone**—Dehydrant and acid neutralizer. Highside Chemicals Co., Newark, N. J.

**Therhumiter**—Thermometers. Weksler Thermometer Corp., New York, N. Y.

**Thermalfin**—Unit coolers. Thermal Co., Inc., Milwaukee, Wis.

**Thermalfuel** — Furnaces. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Thermascrete**—Refractories. Munn and Steele, Inc., Newark, N. J.

**Thermax** — Insulation. Celotex Corp., The, Chicago, Ill.

**Therm-Cote**—Radiation. Extended Surface, Inc., Brooklyn, N. Y.

**Thermek**—Heating and cooling surface. Peerless of America, Inc., Marion, Ind.

**Thermidaire**—Burners, furnaces, heaters. Campbell Heating Co., E. K., Kansas City, Mo.

**Thermix** Dust collector. Prat-Daniel Corp., Port Chester, N. Y.

**Thermo**—Expansion valves. Alco Valve Co., St. Louis, Mo.

**Thermo** — Heaters. American Furnace Co., St. Louis, Mo.

**Thermochek**—Controls. Bell & Gossett Co., Morton Grove, Ill.

**Thermo-Draulic** — Regulators. Perfex Corp., Milwaukee, Wis.

**Thermoflex** — Strainers, heating systems, traps, valves. Cashin Co., W. D., Boston, Mass.

**Thermoflo**—Valves. Bell & Gossett Co., Morton Grove, Ill.

**Thermo-Flow**—Heat exchangers. Thermal Industries, Indio, Calif.

**Thermogage** — Thermometers. Hotstream Heater Co., Cleveland, O.

**Thermogas** — Furnaces, unit heaters. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Thermoguide** — Thermometers. Taylor Instrument Companies, Rochester, N. Y.

**Thermohm** — Psychrometers. Leeds & Northrup Co., Philadelphia, Pa.

**Thermo-Humidigraph** — Recorder-controllers. Bristol Co., The, Waterbury, Conn.

**Thermoil**—Furnaces, unit heaters. Beck Engineering Combustion Kompany, St. Louis, Mo.

**Thermolator**—Valves. Triplex Heating Specialty Co., Peru, Ind.

**Thermolier**—Unit heaters. Grinnell Co., Inc., Providence, R. I.

**Thermopane**—Windows. Libbey-Owens Ford Glass Co., Toledo, O.

**Therm-o-tile**—Conduit. Porter & Co., Inc., H. W., Newark, N. J.

**Thermotrol**—Valves. Sterling Engineering Co., Milwaukee, Wis.

**Thermovent**—Unit ventilators. Nesbitt, Inc., John J., Philadelphia, Pa.

**Thermovoir** — Water heaters. Bell & Gossett Co., Morton Grove, Ill.

**Thin Man**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Thor**—Belting. Goodyear Tire & Rubber Co., Akron, O.

**Thor**—Drills, pumps, reamers, shears. Independent Pneumatic Tool Co., Chicago, Ill.

**Thorobred**—V belts and v belt drives. Dayton Rubber Mfg. Co., Dayton, O.

**Thredolets**—Fittings. Bonney Forge & Tool Wks., Allentown, Pa.

**Thrift**—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

**Throway**—Air filters. American Air Filter Co., Inc., Louisville, Ky.

**Thy-mo-trol** — Adjustable speed electronic motor drive. General Electric Co., Schenectady, N. Y.

**Ti-Compact** — Boilers. Titusville Iron Works Co., Titusville, Pa.

**Ticone**—Boilers. Titusville Iron Works Co., Titusville, Pa.

**Tilco-Fin**—Heating and cooling surface. Extended Surface, Inc., Brooklyn, N. Y.

**Time Saver**—Damper regulators. Goese Mfg. Co., Milwaukee, Wis.

**Timercold** — Time switches. Mercoid Corp., Chicago, Ill.

**Timerelay**—Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Timetrol (Manual)** — Time switches. Penn Electric Switch Co., Goshen, Ind.

**Tin-Ezy**—Coatings, solder and fluxes. Johnson Co., Lloyd S., Chicago, Ill.

**Tin-Loy** — Solder. Eagle-Picher Lead Co., Cincinnati, O.

**Tiny**—Traps. Nason Co., Detroit, Mich.

**Tiscot**—Boilers. Titusville Iron Wks. Co., Titusville, Pa.

**Titan**—Traps. Nason Co., Detroit, Mich.

**Tite** — Caulking compounds. Krehbiel Co., J. H., Chicago, Ill.

**Tite Seal**—Cement and compounds. Radiator Specialty Co., Charlotte, N. C.

**Tom Thumb** — Pipe machines. Oster Mfg. Co., Cleveland, O.

**Toncan**—Pipe, sheets. Republic Steel Corp., Cleveland, O.

**Toncanare** — Electrodes. Universal Power Corp., Cleveland, O.

**Toolarc**—Electrodes. Universal Power Corp., Cleveland, O.

**Toolweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Top-Notch** — Tools. Jessop Steel Co., Washington, Pa.

**Torkflash**—Wrenches. Blackhawk Mfg. Co., Milwaukee, Wis.

**Torqometer** — Torque indicating wrenches. Snap-On Tools Corp., Kenosha, Wis.

**Transite** — Conduit, pipe, refractories, sheets and board. Johns-Manville, New York, N. Y.

**Trans-Lux** — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

**Transparent** — Analyzers, gages, manometers. Dwyer Mfg. Co., F. W., Chicago, Ill.

**Trap-Dri** — Dehydrators. Automatic Products Co., Milwaukee, Wis.

**Trap-it** — Filters. Automatic Products Co., Milwaukee, Wis.

**Trap Nest** — Insulation. Wilson, Inc., Grant, Chicago, Ill.

**Tray**—Cooling towers, condensers. New England Cooling Tower Co., Boston, Mass.

**Treet-O-Control** — Steam system and water treatment. % Proportioneers, Inc. %, Providence, R. I.

**Treet-O-Unit**—Feeders, pumps. % Proportioneers, Inc. %, Providence, R. I.

**Triad**—Stocks and dies. Nye Tool & Machine Co., Chicago, Ill.

**Tri-Clad**—Motors. General Electric Co., Schenectady, N. Y.

**Trident**—Meters. Neptune Meter Co., New York, N. Y.

**Tri-Flux**—Solder. Wolfe-Kote Co., Sheboygan, Wis.

**Trimo**—Cutters, tongs, vises, wrenches. Trimont Mfg. Co., Boston, Mass.

**Trimo** — Cutters. Erie Tool Works, Erie, Pa.

**Trimtherm**—Thermostats. General Controls Co., Glendale, Calif.

**Triple-A**—Enamels and lacquers, protective coatings. Quigley Co., Inc., New York, N. Y.

**Triple Duty**—Heating systems. Bell & Gossett Co., Morton Grove, Ill.

**Triplex**—Stocks and dies. Nye Tool & Machine Co., Chicago, Ill.

**Tripl-Mix**—Cement. Krehbiel Co., J. H., Chicago, Ill.

**Tri-Rotor**—Pumps. Yale & Towne Mfg. Co., Stamford, Conn.

**Tri-Sil**—Dampers. Tuttle & Bailey, Inc., New Britain, Conn.

**Tri-trol**—Regulators, switches, thermostats. Marsh Corp., Jas. P., Chicago, Ill.

**Triumph**—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**Trojan**—Boilers. Burnham Boiler Corp., Irvington, N. Y.

**Truflex**—Bi-metals. General Plate Div., Metals & Controls Corp., Attleboro, Mass.

**Trulirradiant** — Gas burners. Sullivan Valve & Engineering Co., Butte, Mont.

**Trumark**—Protractor for marking pipe. Tru-Line Corp., Los Angeles, Calif.

**Try-Me**—Regulators, strainers, valves. Tryco Products, Inc., Westfield, Mass.

**Tubejet**—Ejector type vacuum pump. Wheeler Mfg. Co., C. H., Philadelphia, Pa.

**Tube-Loy**—Lead alloy tubing. American Smelting & Refining Co., New York, N. Y.

**Tube Master**—Flaring tools. Leonard Precision Products Co., Garden Grove, Calif.

**Tuf-flex** — Gage and sight glasses. Libbey-Owens Ford Glass Co., Toledo, Ohio.

**Tuf-On**—Protective coatings. Wipe-On Corp., New York, N. Y.

**Tulox**—Plastic pipe and tubing. Extruded Plastics, Inc., Norwalk, Conn.

**Turbo** — Air washers, spray nozzles. Bayley Blower Co., Milwaukee, Wis.

**Turbo Vane**—Fans and blowers. B. F. Sturtevant Co., Boston, Mass.

**Turbulaire**—Dryers. Western Precipitation Corp., Los Angeles, Calif.

**Turret** — Pumps. Yeomans Bros. Co., Chicago, Ill.

**Tuway**—Strainers. Wright-Austin Co., Detroit, Mich.

**20th Century**—Bearings. Roller Bearing Co. of America, Trenton, N. J.

**Twin Contact**—Controls. Perfex Corp., Milwaukee, Wis.

**Twin G-Fin** — Preheaters. Griscom-Russell Co., The, New York, N. Y.

**Two Way**—Dampers. Tuttle & Bailey, Inc., New Britain, Conn.

**Tygon** — Protective coatings, plastic tubing. U. S. Stoneware Co., New York, N. Y.

**Tylox**—Pipe couplings. United States Stoneware Co., New York, N. Y.

**Tymit**—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

**Type ME**—Blower wheels, fans. New York Blower Co., Chicago, Ill.

**Tytecote** — Insulation. Specialty Converters, Inc., East Braintree, Mass.

**U. F. S.**—Clamps. Grinnell Co., Inc., Providence, R. I.

**U. S.**—Unions. United Superior Union Co., Inc., Brooklyn, N. Y.

**U. S.**—Valves. Powell Co., Wm., Cincinnati, O.

**U-S-S**—Shapes, sheets. Columbia Steel Co., San Francisco, Calif.

**USS**—Sheets, structural shapes. Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

**U. S. Airco** — Air conditioning equipment. United States Air Conditioning Corp., Minneapolis, Minn.

**UTA**—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

**U-Loy**—Sheets. Republic Steel Corp., Cleveland, O.

**Unaflo** — Steam engines. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

**Unamatic** — Automatic arc welding equipment. Una Welding, Inc., Cleveland, O.

**Unarco**—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

**Unibestos**—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

**Unicoils**—Air conditioning unit. Clarage Fan Co., Kalamazoo, Mich.

**Uniduct**—Ducts and duct fittings. General Heating Products Co., Minneapolis, Minn.

**Uni-fin**—Grilles, registers. Barber-Colman Co., Rockford, Ill.

**Uni-fin**—Air diffusers, dampers, grilles. Barber-Colman Co., Rockford, Ill.

**Union**—Valves. Powell Co., Wm., Cincinnati, O.

**Unipack** — Welding fume exhausters. American Machine Products Co., Marshalltown, Ia.

**Uniplastic**—Furnace and insulating cement. Robinson Insulation Co., Great Falls, Mont.

**Unishears** — Electric shears. Stanley Electric Tools, Div. of The Stanley Works, New Britain, Conn.

**Unisorb** — Bases and pads, insulation. Felters Co., Inc., Boston, Mass.

**Unitaire**—Unit air conditioners. Westinghouse Electric & Mfg Co., Springfield, Mass.

**Unitem**—Heaters. Bell & Gossett Co., Morton Grove, Ill.

**Unitherm**—Unit heaters and coolers. Clarage Fan Co., Kalamazoo, Mich.

**Unitrol**—Regulators, switches, thermostats. Marsh Tritrol Co., Chicago, Ill.

**Universal**—Benders. Hossfeld Mfg. Co., Winona, Minn.

**Universal** — Cast iron pipe. Central Foundry Co., New York, N. Y.

**Universal**—Centrifugal pumps. Bell & Gossett Co., Morton Grove, Ill.

**Universal**—Gas and oil burners. Mettler Co., Lee B., Los Angeles, Calif.

**Universal** — Packing. Johns-Manville, New York, N. Y.

**Universal**—Pipe cutters. Nye Tool & Machine Co., Chicago, Ill.

**Universal**—Regulators. Dockson Corp., Detroit, Mich.

**Universal**—Vibration eliminators. Vibration Control Co., New York, N. Y.

**Universal Unaflow** — Engines. Skinner Engine Co., Erie, Pa.

**Upson**—Bolts and studs. Republic Steel Corp., Bolt & Nut Div., Cleveland, O.

**Utility** — Compressors. Schramm, Inc., West Chester, Pa.

**Utilus**—Fans. Hirschman Co., W. F. Buffalo, N. Y.

**Vacu-Draft** — Blowers. Muncie Gear Wks., Inc., Muncie, Ind.

**Vacuumstat** — Switches. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Valcalox** — Damper regulators. Young Regulator Co., Cleveland, O.

**Valpit** — Unions. Pittsburgh Valve & Fittings Corp., Barberton, O.

**Valvactor**—Valve operators. Foxboro Co., Foxboro, Mass.

**Vapor-seal** — Insulation. Celotex Corp., The, Chicago, Ill.

**Vaporstat** — Switches. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Varipitch**—Pulleys and sheaves. Gates Rubber Co., The, Denver, Colo.

**Vari-Pitch** — Speed changers. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Vedoc**—Enamels and lacquers. Ferro-Enamel Corp., Liquid Plastics Div., Cleveland, O.

**Vee Jet**—Spray nozzles. Spraying Systems Co., Chicago, Ill.

**Veelos**—V-belts. Manheim Mfg. & Belting Co., Manheim, Pa.

**Velometer**—Air velocity meters. Illinois Testing Laboratories, Inc., Chicago, Ill.

**Velvet**—Cement. Keasbey & Mattison Co., Ambler, Pa.

**Vent-Vac**—Heating systems. Anderson Products, Inc., Cambridge, Mass.

**Vento**—Traps. Haines & Co., William S., Philadelphia, Pa.

**Vent-Rite**—Air valves. Anderson Products, Inc., Cambridge, Mass.

**Ventura**—Fans. American Blower Corp., Detroit, Mich.

**Venturafin** — Unit heaters. American Blower Corp., Detroit, Mich.

**Venturi** — Fan housings. Commercial Shearing & Stamping Co., Youngstown, O.

**Venturi** — Meters. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

**Venturi-Flo** — Air diffusers. Barber-Colman Co., Rockford, Ill.

**Verco**—Insulating cement. Nelson Mfg. Co., B. F., Minneapolis, Minn.

**Vercoustic** — Insulation. Nelson Mfg. Co., B. F., Minneapolis, Minn.

**Vermiculite** — Insulation. International Vermiculite Co., Girard, Ill.

**Vernier-Set**—Time switches. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

**Versa-Tool**—Electric drills. York Electric & Machine Co., York, Pa.

**Vertiflow**—Unit heaters. Young Radiator Co., Racine, Wis.

**Vertivent**—Ventilators. Young Radiator Co., Racine, Wis.

**Vescote**—Coatings. Vesco Corp., New York, N. Y.

**V-Flat**—Pulleys and sheaves. Dayton Rubber Mfg. Co., Dayton, O.

**Vibracork** — Bases. Armstrong Cork Co., Lancaster, Pa.

**Vibrasorber**—Vibration absorbers. Chicago Metal Hose Corp., Maywood, Ill.

**Vibro-Bar**—Bases and pads. Korfund Co., Long Island City, N. Y.

**Vibro-Dampers** — Bases. Korfund Co., Long Island City, N. Y.

**Vibro Insulators**—Bases. Goodrich Co., B. F., Akron, O.

**Vibro-Isolator**—Bases and pads. Korfund Co., Long Island City, N. Y.

**Victor** — Steam traps. Wright-Austin Co., Detroit, Mich.

**Victory**—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

**Victron**—Electric motors, louvers and shutters, propeller fan blades and fans. Victor Electric Products, Inc., Cincinnati, O.

**Vim**—Gaskets, leather packing. Houghton & Co., E. F., Philadelphia, Pa.

**Vim Tred**—Leather belting. Houghton & Co., E. F., Philadelphia, Pa.

**Visoleak**—Detectors. Western Thermal Equipment Co., Los Angeles, Calif.

**Vistand**—Vise stands. Armstrong Mfg. Co., Bridgeport, Conn.

**Vitalaire**—Air conditioning units. Ice Cooling Appliance Corp., Morrison, Ill.

**Vitalloy**—Wrenches. Billings & Spencer Co., Hartford, Conn.

**Vitra-Carlite** — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

**Vitriram**—Furnace cement. U. S. Stoneware Co., New York, N. Y.

**V-Meth-L** — Refrigerant. Virginia Smelting Co., West Norfolk, Va.

**Voladjuster** — Dampers. Barber-Colman Co., Rockford, Ill.

**Volcano**—Ventilators. Iwan Brothers, South Bend, Ind.

**Volocitrol** — Louvers, regulators. Barber-Colman Co., Rockford, Ill.

**Vol-U-Trol** — Dampers. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Vortex**—Pumps. Lawrence Pump & Engine Co., Lawrence, Mass.

**Vortex**—Nozzles. Phillips Cooling Tower Co., Inc., New York, N. Y.

**V-tite** — Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

**V-to-V**—Pulleys and sheaves. Dayton Rubber Mfg. Co., Dayton, O.

**Vulcalock**—Fittings, pipe, tanks, valves. Goodrich Co., B. F., Akron, O.

**Vulcan**—Stands, tongs, vises. Williams & Co., J. H., Buffalo, N. Y.

**Vulcan** — Unions. Rockwood Sprinkler Co., Worcester, Mass.

**Vulco** — Belts, drives, pulleys. Gates Rubber Co., Denver, Colo.

**WHS**—Couplings, reducers. Smith, Inc., Winfield H., Springfield, N. Y.

**WJ**—Boiler cleaning compound. Radiator Specialty Co., Charlotte, N. C.

**W. & McD.**—Strainers, valves. Watson & McDaniel Co., Philadelphia, Pa.

**W-S**—Fittings. Watson-Stillman Co., Roselle, N. J.

**W & T**—Anemometers, feeders. Wallace & Tiernan Co., Inc., Belleville, N. J.

**W-W**—Pipe hangers. Western Wire Products Co., St. Louis, Mo.

**Walco-Parmelee**—Wrenches. Walworth Co., New York, N. Y.

**Wallvane**—Fans. Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**Walseal Silbraz**—Fittings, valves. Walworth Co., New York, N. Y.

**Warco**—Refractories. Walsh Refractories Corp., St. Louis, Mo.

**Warco**—Valves. Bridgeport Brass Co., Bridgeport, Conn.

**Wat-a-mat**—Water meters. Pfening Co., Fred D., Columbus, O.

**Watco** — Cooling towers, humidifiers, spray nozzles, spraying systems. Water Cooling Corp., New York, N. Y.

**Water-Boy** — Feeders. Maid-O'-Mist, Inc., Chicago, Ill.

**Waterfilm**—Heating boilers. Koven & Bro., Inc., L. O., Jersey City, N. J.

**Water-Ray-Trola** — Heaters. Ray Oil Burner Co., San Francisco, Calif.

**Water-Sorber**—Dehumidifiers. General Air Conditioning Corp., Cincinnati, O.

**Wenco**—Preheaters, thermostats. Warren Electric Appliance Co., Warren, Pa.

**Wear-Proof** — Pumps. Schneible Co., Claude B., Detroit, Mich.

**Wearweld**—Electrodes. Lincoln Electric Co., Cleveland, O.

**Weathermaker**—Unit air conditioners. Carrier Corp., Syracuse, N. Y.

**Weathermaster**—Unit air conditioners Carrier Corp., Syracuse, N. Y.

**Weathermatic**—Hot water heating systems. Lawler Automatic Controls, Mount Vernon, N. Y.

**Weatherstat**—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

**Weatherwood** — Insulation. United States Gypsum Co., Chicago, Ill.

**Webster-Nesbitt**—Unit heaters. Webster & Co., Camden, N. J.

**Webster-Nesbitt "Little Giant"** — Unit heaters. Nesbitt, Inc., John J., Philadelphia, Pa.

**Weco**—Gas burners. Webster Engineering Co., Tulsa, Okla.

**Wedgbelt**—V belts and v-belt drives, pulleys. American Pulley Co., Philadelphia, Pa.

**Weir**—Furnaces, stokers. Meyer Furnace Co., The, Peoria, Ill.

**Weiralead**—Lead alloy coated sheets. Weirton Steel Co., Weirton, W. Va.

**Weirzin** — Electrolytic zinc coated sheets. Weirton Steel Co., Weirton, W. Va.

**Weldells** — Welding fittings. Taylor Forge & Pipe Works, Chicago, Ill.

**Weldolets**—Fittings. Bonney Forge & Tool Works, Allentown, Pa.

**Weldomatic** — Arc welders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Weld-On**—Heating and cooling surface. Extended Surface, Inc., Brooklyn, N. Y.

**Weldotrol** — Spot welders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Weld-O-Tron**—Arc welders. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Wesco** — Fans. Northwest Foundry & Furnace Co., Portland, Ore.

**Wesco Giant** — Furnaces. Northwest Foundry & Furnace Co., Portland, Ore.

**Westernaire**—Fans. Western Engineering & Mfg. Co., Los Angeles, Calif.

**Westo** — Water treatment. Western Chemical Co., Kansas City, Mo.

**Whirlcone** — Spray nozzles. Water Cooling Equipment Corp., St. Louis, Mo.

**Whirljet**—Spray nozzles. Spraying Systems Co., Chicago, Ill.

**White Star**—Valves. Powell Co., Wm., Cincinnati, O.

**Whiting**—Stokers. Eddy Stoker Corp., Chicago, Ill.

**Whitson**—Steam traps. Healy Ruff Co., St. Paul, Minn.

**Whiz** — Drills. Paramount Products Co., New York, N. Y.

**Wilco**—Bi-metals. Wilson Co., H. A., The, Newark, N. J.

**Wilco**—Pipe cutting machines. Oster Mfg. Co., Cleveland, O.

**Williams-Hager** — Valves. Williams Gauge Co., Pittsburgh, Pa.

**Wilson** — Arc welders. Air Reduction Sales Co., New York, N. Y.

**Wind-O-Vane**—Propeller fans. Sturtevant Co., B. F., Boston, Mass.

**Wind-O-Vent**—Window ventilator and filter units. Reed Unit-Fans, Inc., New Orleans, La.

**Windowstat** — Condensation control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

**Wing-Scruplex** — Fans, ventilators. Wing Mfg. Co., L. J., New York, N. Y.

**Winkler**—Stokers. U. S. Machine Corp., Lebanon, Ind.

**Winter-Chaser**—Air conditioning units, furnaces, heaters. Campbell Heating Co., Des Moines, Ia.

**Wire-Klad**—Air filters. Dollinger Corp., Rochester, N. Y.

**Witch** — Bolts, hangers, protectors. Carpenter & Paterson, Inc., East Boston, Mass.

**Wolverine**—Fans, ventilators. Belanger Fan & Blower Co., Detroit, Mich.

**X-L** — Gaskets, packing. Excelsior Leather Washer Co., Rockford, Ill.

**Xacto** — Meters. Bowser, Inc., Fort Wayne, Ind.

**"X" Boilerliquid**—Compounds. X Laboratories, Inc., New York, N. Y.

**"X" Flush-Rustoff** — Boiler cleaning compounds. X Laboratories, Inc., New York, N. Y.

**"X" Pipejoin**—Cement and compounds. X Laboratories, Inc., New York, N. Y.

**Xit**—Ventilators. Iona Ventilator Co., Inc., Philadelphia, Pa.

**Yager's**—Solder. Benson Co., Inc., Alex R., Hudson, N. Y.

**Yankee** — Regulators. Ohio Products Co., Cleveland, O.

**Yarway** — Alarms, clamps, expansion joints, nozzles, strainers, traps valves. Yarnall-Waring Co., Philadelphia, Pa.

**Yello-Jacket**—Heating boilers. Burnham Boiler Corp., Irvington, N. Y.

**Yorkaire**—Unit air coolers. York Corp., York, Pa.

**Zephaire** — Air conditioning units. American Metal Products Co., Fort Worth, Texas.

**Zeph-O-Cone**—Air diffusers. Waterloo Register Co., Waterloo, Ia.

**Zig Zag**—Heat exchangers. Stout & Sons David, St. Louis, Mo.

**Zim**—Air filters. Chicago Filter Co., Joliet, Ill.

**Zincgrip** — Sheets. American Rolling Mill Co., Middletown, O.

**Zonolite**—Insulation. Munn & Steele, Inc., Newark, N. J.

**Zonolite**—Insulation. Robinson Insulation Co., Great Falls, Mont.

**Zonolite**—Insulation. Universal Zonolite Insulation Co., Chicago, Ill.

## DIRECTORY SECTION

## HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

# PART 3—MANUFACTURERS' ADDRESSES

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A & J Co., 844-848 W. 59th St., Chicago 21, Ill.
A-J Mfg. Co., 2119 Washington St., Kansas City, Mo.
Acadia Synthetic Products Div., Western Felt Works, 4115 Ogden Ave., Chicago, Ill.
Accurate Mfg. Works, 2336-38 Milwaukee Ave., Chicago 47, Ill.
Accurate Metal Weatherstrip, Inc., 216 E. 26th St., New York 10, N. Y.
Acer & Whedon, Inc., Medina, N. Y.
Acheson Mfg. Co., Braddock P. O., Rankin, Pa.
Acker Organization, Inc., W. M., 3167 Fulton Rd., Cleveland, O.
Ackermann Mfg. Co., Wheeling, W. Va.
Acme Asbestos Covering & Flooring Co., 236 N. Elizabeth St., Chicago 7, Ill.
Acme Electric Welder Co., 2618 Fruitland Rd., Los Angeles 11, Calif.
• Acme Industries, Inc., Cor. Mechanic and Ganson Sts., Jackson, Mich.
Acme Refining Co., The, W. 56th & W. & L. E. Ry. Cleveland, O.
Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill.
Acme Tin Plate & Roofing Supply Co., 3rd and Westmoreland Sts., Philadelphia, Pa.
Acme White Lead & Color Works, 8250 St. Aubin Ave., Detroit, Mich.
Acorn Refining Co., 8001 Franklin Ave., Cleveland, O.
Acro Electric Co., 1392 Superior Ave., Cleveland 14, O.
Activator Process Sales Co., 501 S. Marengo Ave., Alhambra, Calif.
Adam Electric Co., Frank, 3650 Windsor St., St. Louis, Mo.
Adams Co., The, E. 4th St., P. O. Box 268, Dubuque, Ia.
Adams Co., Inc., R. P., 55 Chicago St., Buffalo, N. Y.
Advance Aluminum Castings Corp., 2742 W. 36th Pl., Chicago 32, Ill.
Advance Electric & Relay Co., 1260 W. Second St., Los Angeles 26, Calif.
Advance Fan & Blower Co., 3428 Bagley, Detroit, Mich.
Advance Insulating Co., Magee Bldg., Pittsburgh, Pa.
Aeolus Dickinson, 3320 S. Artesian Ave., Chicago 8, Ill.
• Aerofin Corp., 410 S. Geddes St., Syracuse, N. Y.
Aeroil Burner Co., Inc., Park Ave. at 57th St., West New York, N. J.
• Aeroquip Corp., East St., Jackson, Mich.
Aerovent Fan Co., 710 E. Ash St., Piqua, O.
Aget-Detroit Co., 602 First National Bank Bldg., Ann Arbor, Mich.
Agnew Electric Co., Milford, Mich.
Agnew & Tomlinson, 101 Park Ave., New York 17, N. Y.
Ahlberg Bearing Co., 3081 W. 47th St., Chicago, Ill.
Air Conditioning Products Co., 1230-18th St., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Air Controls, Inc., 2311 Superior Ave., Cleveland 14, O.
Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.
Air Filter Engineering Co., 2446 S. Parkway, Chicago 16, Ill.
Aire-Foile Fan & Blower Co., 4737 W. Vernor Highway, Detroit, Mich.
• Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.
• Air & Refrigeration Corp., 475 Fifth Ave., New York, N. Y.
Airecon Industries, 2536 14th Ave., Detroit 16, Mich.
Airgard Mfg. Co., 609 N. La Salle St., Chicago 10, Ill.
Airmaster Corp., 4317 Ravenswood Ave., Chicago, Ill.
• Air-Maze Corp., 5200 Harvard Ave., Cleveland 5, O.
Air Supply Co., 2726 N. Ashland Ave., Chicago, Ill.
AirO-Fin Register Co., 16195 Meyers Rd., Detroit 27, Mich.
Air-O-Cel Industries, Inc., 11616 Cloverdale Ave., Detroit, Mich.
Air-Stream Filter Corp., 2100 Washington Ave., St. Louis 3, Mo.
• Airtemp, Div. of Chrysler Corp., 1119 Leo St., Dayton 1, O.
• Airtherm Mfg. Co., 711 S. Spring Ave., St. Louis 10, Mo.
Airwasher Corp., 1122 N. Washington Ave., Lansing, Mich.
Ajax Flexible Coupling Co., Westfield, N. Y.
Akron Metallic Gasket Co., 155 N. Union, P. O. Box 911, Akron 9, O.
Akwa Heaters, Inc., 1955 Park Ave., New York 35, N. Y.
Alabama Pipe Co., Anniston, Ala.
Aladdin Heating Corp., 2222 San Pablo Ave., Oakland, Calif.
Albertson & Co., Inc., Sioux City, Ia.
Albright Equipment Co., 100 Station St., Johnstown, Pa.
• Alco Valve Co., 865 Kingsland Ave., St. Louis 5, Mo.
Aldrich Pump Co., 4 Pine St., Allentown, Pa.
Alexander Bros., 406 N. 3rd, Philadelphia, Pa.
Alfol Insulation Co., Inc., 155 E. 44th St., New York, N. Y.
All Metal Weatherstrip Co., 229 W. Illinois St., Chicago, Ill.
Allegheny Ludlum Steel Corp., Brackenridge Pa.
Allen Billmyre Co., 431 Fayette Ave., Mamaroneck, N. Y.
Allen-Bradley Co., 1335 S. First St., Milwaukee, Wis.
• Allen Corp., 9767 Erwin Ave., Detroit 13, Mich.
Allied Weld-Craft, Inc., 401 W. South St., Indianapolis 4, Ind.
Allington & Curtis Mfg. Co., 1500 Holland Ave., Saginaw, Mich.
• Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
• Allis Co., Louis, The, 427 E. Stewart St., Milwaukee 7, Wis.
Allison Tool & Engineering Co., 4031 Whittier Blvd., Los Angeles 23, Calif.
Alloy Steel Products Co., 1506 W. Elizabeth Ave., Linden, N. J.
Allpax Co., Inc., Mamaroneck, N. Y.
All-Vac Steam Control System, 205 W. Wacker Dr., Chicago, Ill.; General Sales Office, 3145 N. Mascher St., Philadelphia 33, Pa.
Alpha Metals, Inc., 363 Hudson Ave., Brooklyn 1, N. Y.
Alphil Spot Welding Co., 431 W. Broadway, New York 12, N. Y.
Alrose Chemical Co., Providence, R. I.
Alten's Foundry & Machine Works, 226 W. Wheeling St., Lancaster, O.
Alton Mineral Wool Insulation Co., P. O. Box 34, Alton, Ill.
Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh, Pa.
Amercoat Div., American Pipe & Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif.
American Agile Corp., 5806 Hough Ave., Cleveland 3, O.
American Air Conditioning Co., Boulevard Bldg., Detroit, Mich.
• American Air Filter Co., Inc., 107 Central Ave., Louisville 8, Ky.
American Automatic Typewriter Co., 614 N. Carpenter St., Chicago, Ill.
American Blower Corp., Detroit 32, Mich.
• American Brass Co., 414 Meadow St., Waterbury 88, Conn.
American Car & Foundry Co., 36 Church St., New York, N. Y.
American Cast Iron Pipe Co., 2930 N. 16th St., Birmingham 2, Ala.
American Coal Burner Co., 12-20 E. Erie St., Chicago 11, Ill.
American Coils, Inc., 25-27 Lexington St., Newark 5, N. J.
American Coolair Corp., 3604 Mayflower St., P. O. Box 2300, Jacksonville 3, Fla.
American Cooling Tower Co., 2710 McGee St., Kansas City, Mo.
• American District Steam Co., 25 Bryant St., North Tonawanda, N. Y.
American District Telegraph Co., 155 Sixth Ave., New York, N. Y.
• American Engineering Co., Aramingo Ave. and Cumberland St., Philadelphia 25, Pa.
American Flange & Mfg. Co., Inc., 1901 R. C. A. Bldg., New York 20, N. Y.
American Flexible Coupling Co., 1801 Pittsburgh Ave., Erie, Pa.
American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.
American Foundry & Furnace Co., Washington St. at McClun, Bloomington, Ill.
American Furnace Co., 2719-31 Delmar Blvd., St. Louis 3, Mo.
American Hair & Felt Co., 1828 Merchandise Mart, Chicago 54, Ill.
American Hammered Piston Ring Div., Koppers Co., Bush and Hamburg Sts., Baltimore, Md.
American Hard Rubber Co., 11 Mercer St., New York, N. Y.
American Injector Co., 1481-14th St., Detroit 16, Mich.
American Instrument Co., Silver Spring, Md.
American K. A. T. Corp., 331 Madison Ave., New York 17, N. Y.
American-Larson Ventilating Co., 1004 Keystone Bank Bldg., Pittsburgh, Pa.
American Locomotive Co., Alco Products Div., 30 Church St., New York, N. Y.
American Locomotive Co., Diesel Engine Div., Auburn, N. Y.
American Machine Products Co., 401 S. Third Ave., Marshalltown, Ia.
American Manganese Bronze Co., Rhawn & Hegerman Sts., Philadelphia, Pa.
American-Marietta Co., 43 E. Ohio St., Chicago 11, Ill.
American-Marsh Pumps, Inc., 60 Capital Ave., N. E. Battle Creek, Mich.
American Metal Hose Branch, American Brass Co., 67 Jewelry St., Waterbury, Conn.
American Metal Products Co., 730 Hudgins St., Box 66 Sylvania Sta., Fort Worth 9, Tex.
American Metal Weather Strip Co., 144 N. Division Ave., Grand Rapids 2, Mich.
American Meter Co., Inc., 60 E. 42nd St., New York 17, N. Y.
American Moistening Co., 260 W. Exchange St., Providence, R. I.
American Molded Products Co., 1644 N. Honore St., Chicago 22, Ill.
American Nickeloid Co., 113 Second St., Peru, Ill.
American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, Ill.
• American Pipe Bending Machine Co., Inc., 37 Pearl St., Boston 10, Mass.
American Pipe Tool Co., 4856 W. Kinzie St., Chicago 44, Ill.
American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

• Advertisement in this issue. See Index to Advertisers, page 350.

American Radiator & Standard Sanitary Corp., Bessemer Bldg., Pittsburgh 22, Pa.
● American Rolling Mill Co., The, 703 Curtis St., Middletown, O.
American Schaefer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., 11 Elias St., Bridgeport 2, Conn.
American Sheet Metal Works, 331 N. Alexander, New Orleans, La.
American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.
American Solder & Flux Co., 2152 E. Norris St., Philadelphia, Pa.
American Steel Band Co., Box 565, Pittsburgh 30, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland 13, O.
American Sterilizer Co., Erie, Pa.
American Teksag Products Co., Inc., 395 N. MacQuesten Pkwy., Mt. Vernon, N. Y.
American Thermometer Co., 2907 Clark Ave., St. Louis, Mo.
American Warming & Ventilating Co., 1017-1021 Summit St., Toledo 4, O.
American Water Softener Co., Lehigh Ave. and 4th St., Philadelphia 33, Pa.
American Well Wks., 100 N. Broadway, Aurora, Ill.
American Zinc Products Co., Greencastle, Ind.
Ames Co., W. R., 150 Hooper St., San Francisco 7, Calif.
● Ames Hydrovac Corp., 290 Scholes St., Brooklyn 6, N. Y.
Ames Iron Works, Division of Pierce Butler Radiator Corp., Oswego, N. Y.
Amirton Co., Inc., 149 Broadway, New York 6, N. Y.
Anchor Packing Co., 401 N. Broad St., Philadelphia, Pa.
Anchor Post Fence Co., Fluid Heat Div., 6500 Eastern Ave., Baltimore 24, Md.
Anchor Stove & Range Co., Third & Culbertson Sts., New Albany, Ind.
Andale Co., 1604 Arch, Philadelphia, Pa.
Andersen Corp., Bayport, Minn.
● Anderson Co., V. D., The, 1949 W. 96th St., Cleveland 2, O.
Anderson Engine & Foundry Co., Anderson, Ind.
Anderson Products, Inc., 17 Tudor St., Cambridge 39, Mass.
Anderson-Stolz Corp., 1731 Walnut St., Kansas City, Mo.
Anemostat Corp. of America, 10 E. 39th St., New York 16, N. Y.
Anetsberger Bros., 3505 Elston Ave., Chicago, Ill.
Ansul Chemical Co., Marinette, Wis.
Apex All Weather Products, Engineering Div., Builders Bldg., Chicago 1, Ill.
Apollo Steel Co., 609 Warren Ave., Apollo, Pa.
April Showers Co., 4126 Eighth St., N.W., Washington 11, D. C.
Aqua-Mist Co., 426 Jefferson St., Topeka, Kans.
Aqua-Restor Div., Mayer Mfg. Corp., 50 Division Pl., Brooklyn, N. Y.
Aqua-Sorb Co., 21 S. 16th St., East Orange, N. J.
Aquatic Chemical Laboratories, Inc., 95 Liberty St., New York 6, N. Y.
Arcos Corp., 401 N. Broad St., Philadelphia, Pa.
Arcweld Mfg. Co., Inc., 3469 Third Ave., W., Seattle 99, Wash.
Arens Controls, Inc., 2267 S. Halsted St., Chicago, Ill.
Arex Co., 333 N. Michigan Ave., Chicago, Ill.
Armour Ammonia Works, 1355 W. 31st St., Chicago, Ill.
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Rd., Chicago, Ill.
Armstrong Bros. Tool Co., 317-357 N. Francisco Ave., Chicago, Ill.
Armstrong Co., The, Post Ave. and South St., Detroit, Mich.
● Armstrong Cork Co., 4400 Concord St., Lancaster, Pa.
Armstrong Heat Control Co., 523 S. E. 39th St., Portland 15, Ore.
● Armstrong Machine Wks., 874 Maple St., Three Rivers, Mich.
Armstrong Mfg. Co., 303 Knowlton St., Bridgeport, Conn.
Arrow-Hart & Hegeman Elect. Co., 103 Hawthorn St., Hartford, Conn.
Art Valve Co., 4237 N. Lincoln, Chicago 18, Ill.
Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.
Ashton Valve Co., 161-1st St., Cambridge 42, Mass.
Askania Regulator Co., 1603 S. Michigan Ave., Chicago 16, Ill.
Asphalt Products Co., Eastwood Sta., Syracuse, N. Y.
Atkins & Co., E. C., 402 S. Illinois St., Indianapolis 9, Ind.
Atlantic Metal Hose Co., Inc., 123 W. 64th St., New York, N. Y.
Atlantic Steel Boiler Co., 21st St. and Washington Ave., Philadelphia 46, Pa.
Atlantic Steel Co., P. O. Box 1714, Atlanta 1, Ga.
Atlas Chemical Co., Marietta, O.
Atlas Electric Devices Co., 361 W. Superior St., Chicago, Ill.
Atlas Valve Co., Inc., 282 South St., Newark, N. J.
Atlas Welding Accessories Co., 14820 Wyoming Ave., Detroit 21, Mich.
Auburn Foundry Inc., Stoker Div., Auburn, Ind.
Auditorium Conditioning Corp., 17 E. 42nd St., New York, N. Y.
● Auer Register Co., 3608 Payne Ave., Cleveland 14, O.
Aurora Pump Co., 619 Loucks St., Aurora, Ill.
Austin-Mason Co., 15 Park Row, New York, N. Y.
● Au-Temp-Co Corp., 521 Fifth Ave., New York 17, N. Y.
Autoforce Ventilating System, 244 Washington St., Boston 8, Mass.
Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.
Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21, Pa.
● Automatic Products Co., 2450 N. 32nd St., Milwaukee 10, Wis.
Automatic Pump & Softener Corp., 1907 Kishwaukee St., Rockford, Ill.
Automatic Switch Co., 41 E. 11th St., New York 3, N. Y.
Automatic Temperature Control Co., Inc., 44 E. Logan St., Philadelphia 44, Pa.
Automatic Ventilator Co., 503 S. Shiawasse, Corunna, Mich.
Automotive Maintenance Machinery Co., North Chicago, Ill.
Azor Corp., 107 Montgomery Ave., Irvington, N. J.
B/W Controller Corp., 2200 E. Maple Ave., Birmingham, Mich.
Babbitt Industrial Specialties Co., 630 Fifth Ave., New York 20, N. Y.
Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Babcock & Wilcox Tube Co., The, Welded Tube Div., Alliance, O.
Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.
Bache & Co., Semon, Greenwich & Morton Sts., New York 14, N. Y.
Badger Corp., 327 E. Brown St., Milwaukee 12, Wis.
● Badger & Sons Co., E. B., 75 Pitts St., Boston 14, Mass.
Badger Fire Extinguisher Co., 624 Somerville Ave., Somerville 43, Mass.
Baer Bros., 438 W. 37th St., New York 18, N. Y.
Bahnson Co., 1001 S. Marshall St., Winston-Salem, N. C.
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, O.
● Baker Ice Machine Co., Inc., 1531 Evans St., Omaha 1, Nebr.
● Baldor Electric Co., 4353 Duncan Ave., St. Louis 10, Mo.
Baldwin Belting, Inc., 85 Chambers St., New York, N. Y.
Baldwin De La Vergne Sales Corp., Paschall P. O., Philadelphia, Pa.
Baldwin-Hill Co., 531 Klagg Ave., Trenton 2, N. J.
Ballantyne Co., 222 N. 16th St., Omaha 2, Nebr.
Balloffet Dies and Nozzle Co., Inc., 6825 Adams St., Guttenberg, N. J.
Bantam Bearings Div., The Torrington Co., South Bend 21, Ind.
● Barber-Colman Co., 1228 Rock St., Rockford, Ill.
Barber Gas Burner Co., 3704 Superior Ave., Cleveland 14, O.
Barclay, Inc., Robert, 128 N. Peoria St., Chicago, Ill.
Barco Mfg. Co., Not Inc., 1801 Winnemac Ave., Chicago 40, Ill.
Bardco Mfg. & Sales Co., 2450 E. 23rd St., Los Angeles, Calif.
Bargar Sheet Metal Co., 12401 Euclid St., Cleveland, O.
Barland Weatherstrip Material Co., 1960 E. 59th St., Cleveland 3, O.
Barnes & Jones, Inc., 128 Brookside Ave., Jamaica Plain, Boston 30, Mass.
Barnes Tool Co., The, 152 Brewery St., New Haven 6, Conn.
Barrett Div., The, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.
Barrett, Haentjens & Co., Hazleton, Pa.
Barrett Machine Co., 912-916 Behan St., N. S., Pittsburgh 12, Pa.
Bartlett Mfg. Co., 3003 E. Grand Blvd., Detroit 2, Mich.
Bastian-Morley Co., Inc., LaPorte, Ind.
Bath Co., Cyril J., The, E. 70th and Machinery Ave., Cleveland 8, O.
Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.
Bayer Co., 4030 Chouteau Ave., St. Louis 10, Mo.
Bayley Blower Co., 1817 S. 66th St., Milwaukee 14, Wis.
Beach-Russ Co., 64A Church St., New York, N. Y.
Beacon-Morris Corp., 110-114 Brookline Ave., Boston 15, Mass.
Bear Mfg. Co., Industrial Div., Rock Island, Ill.
Bearings Co. of America, 501 Harrisburg Ave., Lancaster, Pa.
Beaton & Cadwell Mfg. Co., 185 Main St., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Beatty Machine & Mfg. Co., 934 150th St., Hammond, Ind.
Beaver Pipe Tools, Inc., 310 Dana Ave., Warren, O.
Beck Engineering Combustion Kompany, 2100 Cole St., St. Louis 6, Mo.
Beckett & Co., Thomas, 2118 Griffin St., Dallas 2, Tex.
Beckley Perforating Co., 301 North Ave., Garwood, N. J.
Belanger Fan & Blower Co., 1230 18th St., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., 3830-32 Olive St., St. Louis 8, Mo.
Belfield Co., H., 435 N. Broad St., Philadelphia, Pa.
Belknap Mfg. Co., 800 Union Ave., Bridgeport 1, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Belmont Packing & Rubber Co., The, Butler & Sepviva Sts., Philadelphia, Pa.
Belmont Smelting & Refining Wks., Inc., 349 Belmont Ave., Brooklyn 7, N. Y.
Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.
Benjamin Air Rifle Co., 1527 S. 8th St., St. Louis 4, Mo.
Benjamin Electric Mfg. Co., Des Plaines, Ill.
Bennett Oil Co., 964 S. Saddle Creek Rd., Omaha 6, Nebr.
Benson Co., Inc., Alex R., 1040 Bay Rd., So. Hudson, N. Y.
Berger Bros. Co., 229-237 Arch St., Philadelphia, Pa.
Berger Mfg. Div., Republic Steel Corp., 1038 Belden Ave., Canton 5, O.
Bern's Specialty Mfg. Co., 2278 Elston Ave., Chicago, Ill.
Bernz Co., Inc., Otto, 280 Lyell Ave., Rochester 6, N. Y.
Bertsch & Co., Inc., Church St., Cambridge City, Ind.
Best Register Co., 2005 W. Oklahoma Ave., Milwaukee 7, Wis.
Bethlehem Foundry & Machine Co., W. Second St., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Betz Corp., 460 State St., Hammond, Ind.
Beverly Throatless Shear Co., 3009 W. 110th Pl., Chicago, Ill.
Bien Air Conditioning Co., Bell, Calif.
Biersach & Niedermeyer Co., 1937 N. Hubbard St., Milwaukee 12, Wis.
Bigelow Co., 174 River St., New Haven 13, Conn.
Biggs Boiler Wks. Co., The, Case Ave. and B. & O. R. R., E. Akron 5, O.
Bignall & Keeler Machine Wks., Edwardsville, Ill.
Billings & Spencer Co., 1 Laurel St., Hartford 6, Conn.
Binks Mfg. Co., 3114-40 Carroll Ave., Chicago 12, Ill.
Bird-Archer Co., 4337 North American St., Philadelphia 40, Pa.
● Bird-White Co., 3119 W. Lake St., Chicago, Ill.
Bishop & Babcock Mfg. Co., 4901 Hamilton Ave., Cleveland 14, O.
Black & Decker Mfg. Co., Pennsylvania Ave., Towson, Md.
Black Magic Products Co., P. O. Box 1703, Tulsa, Okla.
Black-Sivalls & Bryson, Inc., 7501 E. 10th St., Kansas City 3, Mo.

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Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich.
Blaisdell Compressor Co., 227 Fulton St., New York, N. Y.
Bliss Co., E. W., 1420 Hastings St., Toledo, O.
Blocksom & Co., E. 5th St., Michigan City, Ind.
Blood Brothers Machine Co., Div. of Standard Steel Spring Co., Allegan, Mich.
Blower Application Co., 918 N. Fourth St., Milwaukee 3, Wis.
Blue Ridge Talc Co., Inc., Henry, Va.
Blue Seal Chemical Co., 177 Westfield Ave., W., Roselle Park, N. J.
Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.
Boester, Carl F., 101 E. Essex—Kirkwood, St. Louis, Mo.
Bogue Electric Co., 37 Kentucky Ave., Paterson 3, N. J.
Bohn Aluminum & Brass Corp., 2306 Franklin St., Detroit, Mich.
Boiler Room Equipment, Inc., 468 Fourth Ave., New York, N. Y.
Bonafide Genasco, Inc., 295 Fifth Ave., New York 16, N. Y.
● Bonney Forge & Tool Wks., Tilghman St. & Meadow St., Allentown, Pa.
Bordo Co., Inc., L. J., 115 New St., Glenside, Pa.
Borg-Erickson Corp., 469 E. Ohio St., Chicago 11, Ill.
Borm Mfg. Co., Elgin, Ill.
Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Boston Woven Hose & Rubber Co., P. O. Box 1071, Boston 3, Mass.
Botfield Refractories Co., Swanson & Clymer Sts., Philadelphia 47, Pa.
Bowen Research Corp., Garwood, N. J.
Bowser, Inc., 1302 E. Creighton Ave., Fort Wayne 5, Ind.
Boylston Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.
Brabender Corp., Rochelle Park, N. J.
Brasco Mfg. Co., Harvey, Ill.
Brauer Supply Co., A. G., 2100 Washington Ave., St. Louis 3, Mo.
Breidert Co., G. C., 634 S. Spring St., Los Angeles 14, Calif.
Bremil Mfg. Co., Box 1030, Erie, Pa.
Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.
Bridgeport Thermostat Co., Inc., Connecticut Ave., Bridgeport 1, Conn.
Bristol Co., The, P.O. Box 1790, Waterbury 91, Conn.
Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia, Pa.
Brookfield Engineering Laboratories, Sharon, Mass.
Brooks Equipment Corp., 90 West Ave., New York 6, N. Y.
Bros Boiler & Mfg. Co., Wm., 1057 Tenth Ave., S. E., Minneapolis 14, Minn.
Brown-Brockmeyer Co., Inc., 1098 Smithville Rd., Dayton, O.
Brown Fintube Co., The, Elyria, O.
Brown-Ford Corp., Newton, Mass.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., 4534 Wayne Ave., Philadelphia 44, Pa.
Brownell Co., 300 N. Findlay St., Dayton 1, O.
Browning Mfg. Co., Inc., 1940 Browning Blvd., Maysville, Ky.
Brundage Co., The, 500-514 N. Park St., Kalamazoo 11, Mich.
Bruning Co., Inc., Charles, 42-33 Ninth St., Long Island City, N. Y.
Brunner Mfg. Co., 1821 E. Broad St., Utica 1, N. Y.
Bryan Steam Corp., P. O. Box 337, Peru, Ind.
● Bryant Heater Co., The, 17825 St. Clair Ave., Cleveland 10, O.
Bubar, Hudson H., 15 Park Row, New York 7, N. Y.
Buckeye Portable Tool Co., 25 W. Apple St., Dayton, O.
Buckeye Products Co., 7024 Vine St., Cincinnati 16, O.
Buda Co., Harvey, Ill.
Buffalo Bolt Co., North Tonawanda, N. Y.
● Buffalo Forge Co., 171 Mortimer St., Buffalo, N. Y.
Buffalo Foundry & Machine Co., 43 Winchester Ave., Buffalo, N. Y.
Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
● Buffalo Pumps, Inc., 171 Mortimer St., Buffalo, N. Y.
Buffalo Tank Corp., Dunellen, N. J.; Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, 9 Codding St., Providence 1, R. I.
Bullard Co., The, 286 Canfield Ave., Bridgeport 2, Conn.
Bundy Steam Trap Co., Nashua, N. H.
Bundy Tubing Co., 10951 Hern Ave., Detroit 13, Mich.
Burgess-Norton Mfg. Co., 773 Peyton St., Geneva, Ill.
Burhorn Co., Edwin, 554 W. 48th St., New York 19, N. Y.
Burke Electric Co., 1201 W. 12th St., Erie, Pa.
Burke Stoker & Mfg. Co., 921 W. 19th St., Chicago, Ill.
Burling Instrument Co., Air Conditioning Div., 253 Springfield Ave., Newark 3, N. J.
Burnham Boiler Corp., Main St., Irvington, N. Y.
Burnham Stoker Co., 505 Columbia St., Vancouver, Wash.
Burnley Battery & Mfg. Co., Clay St., North East, Pa.
Burrows Mfg. Co., F. A., 318 E. Poplar St., York, Pa.
Burt Mfg. Co., 635 Main St., Akron, O.
Bury Compressor Co., 18th & Cascade Sts., Erie, Pa.
● Bush Mfg. Co., 100 Wellington St., Hartford 6, Conn.
● Byers Co., A. M., Clark Bldg., Pittsburgh 22, Pa.
Byron Jackson Co., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif.
C-B Tool Co., Wabank Rd., Lancaster, Pa.
C & H Air Conditioning Fan Co., Inc., Edgewood Ave. and Ivy St., N. E., Atlanta 3, Ga.
Cabot, Inc., Samuel, 141 Milk St., Boston 9, Mass.
Calbar Paint & Varnish Co., 2612-26 N. Martha St., Philadelphia 25, Pa.
Caldwell Co., W. E., 2120 Brook St., Louisville, Ky.
● Caldwell Co., Wm. J., 1129 Vermont Ave., N. W., Washington 3, D. C.
Callahan Can Machine Co., Inc., 80 Richard St., Brooklyn, N. Y.
Calorider Corp., 1 Atlantic St., Stamford, Conn.
Caloroil Burner Corp., 1477 Park St., Hartford, Conn.
Campbell Heating Co., E. K., 2445 Charlotte St., Kansas City 8, Mo.
Campbell Heating Co., 31st & Dean, P. O. Box 833, Des Moines 4, Ia.
Canatsey Electric Mfg. Co., 620 Wyandotte St., Kansas City, Mo.
Cannon Chemical Co., 210 Broadway, Everett 49, Mass.
Canton Stoker Corp., 407 Andrew Place, S. W., Canton 1, O.
Canvas Products Co., 1236 S. 7th St., St. Louis, Mo.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., 2306 Franklin St., Detroit, Mich.
Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y.
Carey Mfg. Co., Philip, Wayne Ave., Lockland, Cincinnati 15, O.
Cargocaire Engineering Corp., 75 West St., New York, N. Y.
Carlin Co., Anthony, 2717 E. 75th St., Cleveland, O.
Carling Turbine Blower Co., 25 St. John's Rd., Worcester 2, Mass.
Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 19, Pa.
Carnes, Inc., John R., Greenlawn Ave. & Erie R. R., Lima, O.
Carney Rockwool Co., Mankato, Minn.
Carpenter & Paterson, Inc., 1190 Bennington St., East Boston, Mass.
Carpenter Steel Co., The, Welded Alloy Tube Div., Kenilworth, N. J.
Carrier Corp., 302 S. Geddes St., Syracuse, N. Y.
Carter Paint Co., 310 N. Main St., Liberty, Ind.
Carter Products Corp., 6921 Carnegie Ave., Cleveland 3, O.
Carty & Moore Engineering Co., 511 W. Larned St., Detroit, Mich.
Case & Son Mfg. Co., W. A., 33 Main St., Buffalo 3, N. Y.
● Cash Co., A. W., P. O. Box 135, Decatur, Ill.
Cash Valve Mfg. Co., A. W., 666 Wabash Ave., Decatur 8, Ill.
Cashin Co., W. D., 69 A St., Boston 27, Mass.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Caterpillar Tractor Co., 600 W. Washington St., Peoria, Ill.
Catskill Metal Works, Inc., Catskill, N. Y.
Celotex Corp., The, 120 S. La Salle Bldg., Chicago, Ill.
Cement Lined Pipe Co., 93 Brookline St., Lynn, Mass.
Central Brass Mfg. Co., 2950 E. 55th St., Cleveland, O.
Central Die Casting & Mfg. Co., Inc., 2935 W. 47th St., Chicago, Ill.
Central Foundry Co., 386 Fourth Ave., New York 16, N. Y.
Central Rubber & Steel Corp., 433 W. Main Cross St., Findlay, O.
Central Station Steam Co., 2920 E. Woodbridge St., Detroit 7, Mich.
Central Wire & Iron Works, 621 E. Locust St., Des Moines, Ia.
Centrifix Corp., 3029 Prospect Ave., Cleveland 15, O.
Centri-Spray Co., 14290 Meyers Rd., Detroit 27, Mich.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Century Engineering Corp., 401-431 3rd St., S. E., Cedar Rapids, Ia.
Century Fan & Ventilator Co., 103 E. 125th St., New York, N. Y.
Certain-teed Products Corp., 100 E. 42nd St., New York, N. Y.
Certified Flexible Couplings, 369 Lexington Ave., New York 17, N. Y.
Certified Gauge & Instrument Corp., Maytag Bldg. at 34th St., Long Island City, N. Y.
Chace Co., W. M., 1606 Beard Ave., Detroit 9, Mich.
Chain Belt Co., 1617 W. Bruce, Milwaukee 4, Wis.
Chamberlin Metal Weather Strip Co., 1254 La Brosse St., Detroit 26, Mich.
Champion Blower & Forge Co., Harrisburg Ave. and Charlotte St., Lancaster, Pa.
Champion Furnace Pipe Co., 215 Eaton St., Peoria 3, Ill.
Champion Machine & Forging Co., 3695 E. 78th St., Cleveland 5, O.
Champion Unit Heater Co., 4639-41 Washington Blvd., Chicago, Ill.
Chandler Co., 804 First Ave., N. W., Cedar Rapids, Ia.
Chaplin-Fulton Mfg. Co., 28-40 Penn Ave., Pittsburgh, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Char-Gale Mfg. Co., 3127 Hiawatha Ave., Minneapolis 6, Minn.
Chase Brass & Copper Co., 236 Grand St., Waterbury 91, Conn.
Cheeseman-Elliot Co., Inc., Kent Ave., Brooklyn 11, N. Y.
● Chelsea Fan & Blower Co., Inc., 1206 S. Grove St., Irvington 11, N. J.
● Chelsea Products, Inc., 1206 S. Grove St., Irvington 11, N. J.
Chelsea Metal Stamping Co., 95 8th Ave., New York, N. Y.
Cheney Metal Products Co., 623 Prospect St., Trenton 5, N. J.
Chesapeake & Ohio R.R. Co., Terminal Tower, Cleveland, O.
Chicago Belting Co., 113-125 N. Green St., Chicago 7, Ill.
Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago 4, Ill.
Chicago Die Casting Mfg. Co., 2515 W. Monroe St., Chicago 12, Ill.
Chicago Expansion Bolt Co., 2240 W. Ogden Ave., Chicago 12, Ill.
Chicago Filter Co., Joliet, Ill.
Chicago Fire Brick Co., 1467 N. Elston Ave., Chicago, Ill.
Chicago Furnace Supply Co., 1278 Clybourn Ave., Chicago, Ill.
Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.
Chicago Metal Mfg. Co., 3724 S. Rockwell St., Chicago 32, Ill.
Chicago Nipple Mfg. Co., 1966 Southport Ave., Chicago 14, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Chicago Pump Co., 2323 Wolfram St., Chicago 18, Ill.
Chicago Specialty Mfg. Co., 2954 Lawrence Ave., Chicago 25, Ill.
Chicago Steel Tank Co., 6400 W. 66th, Chicago, Ill.

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Chicago Steel & Wire Co., 103rd St. and Torrence Ave., Chicago 17, Ill.
Chicago-Wilcox Mfg. Co., E. 77th St. and Anthony Ave., Chicago, Ill.
Chisholm Co., Allen E., 2640 E. Burnside St., Portland, Ore.
Cincinnati Electrical Tool Co., The, 2684 Madison Rd., Cincinnati 8, O.
Cincinnati Shaper Co., Hopple, Garrard and Elam, Cincinnati, O.
Cincinnati Sheet Metal & Roofing Co., The, 230 E. Front St., Cincinnati, O.
Circulators & Devices Mfg. Corp., 22 Rose St., New York, N. Y.
Cissell Mfg. Co., W. M., 331 S. First St., P. O. Box 1143, Louisville 1, Ky.
● Clarage Fan Co., Porter St., Kalamazoo 16, Mich.
Clark Bros. Bolt Co., Milldale, Conn.
Clark Controller Co., 1146 E. 152nd St., Cleveland 10, O.
Clark Cooper Co., Palmyra, N. J.
Clark Dust Control Co., 210 N. Mozart St., Chicago, Ill.
Clark Jr. Electric Co., Jas., 600 Bergman St., Louisville, Ky.
Clauss Shear Co., Fremont, O.
Clay Equipment Corp., Cedar Falls, Ia.
Clayton & Lambert Mfg. Co., 14247 Tireman Ave., Dearborn, Mich.
Clayton Mfg. Co., Alhambra, Calif.
Cleaver-Brooks Co., 5100 N. 33rd St., Milwaukee, Wis.
Cleghorn Co., 86 Broad St., Boston, Mass.
Cleveland Humidifier Co., 7802 Wade Park Ave., Cleveland 3, O.
Cleveland Punch & Shear Works Co., E. 40th and St. Clair Ave., Cleveland 14, O.
● Clifford Mfg. Co., 564 E. First St., Boston, Mass.
Clinton Metallic Paint Co., P. O. Box 278, Clinton, N. Y.
Clizbe Bros. Mfg. Co., Plymouth, Ind.
Clow & Sons, James B., 201-299 N. Talman Ave., Chicago 12, Ill.
Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.
Coddington Mfg. Co., E. D., 5024 N. 37th St., Milwaukee, Wis.
Coe Mfg. Co., Bank St., Painesville, O.
Cohoes Rolling Mill Co., Canvass and Cortland Sts., Cohoes, N. Y.
Cole-Sullivan Engineering Co., 1316 Third St., N., Minneapolis, Minn.
Colebrook & Sons, Inc., W. H., 246 Walton St., Syracuse, N. Y.
Colonial Alloys Co., Metals Div., E. Somerset, Trenton Ave. and Reading R. R., Philadelphia, Pa.
Columbia Radiator Co., 3400 Walnut St., McKeesport, Pa.
Columbia Steel Co. (Sub. United States Steel Corp.), Russ Bldg., 235 Montgomery St., San Francisco 6, Calif.
Columbian Steel Tank Co., 1509 W. 12th St., Kansas City, Mo.
Columbus Heating & Ventilating Co., 182 N. Yale Ave., Columbus 16, O.
Columbus Steam Pump Wks. Co., 724 W. Gay St., Columbus 8, O.
Combination Boiler Co., Benton Harbor, Mich.
● Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.
Combustion Engineering Co., Inc., 200 Madison Ave., New York, N. Y.
Comfort Products Corp., 7 W. 147th St., Harvey, Ill.
Commercial Plastics Co., 201 N. Wells St., Chicago, Ill.
● Commercial Shearing & Stamping Co., 1775 Logan, Youngstown, O.
Commonwealth Brass Corp., 5781-5835 Commonwealth Ave., Detroit 8, Mich.
Commonwealth Electric Welder Mfg. Co., 3200-F W. Oxford St. Philadelphia, Pa.
Commonwealth Products Co., Real Estate Trust Bldg., Philadelphia 7, Pa.
Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
Conditionaire Unit Co., 2821 Montrose Ave., Chicago 18, Ill.
Congress Die Casting Div., Congress Tool & Die Co., 3750 E. Outer Drive, Detroit 12, Mich.
Conklin Brass & Copper Co., Inc., T. E., 54-60 Lafayette St., New York, N. Y.
Conneaut Plastic Metallic Packing Co., Conneaut, O.
Connery Construction Co., 2nd and Luzerne Sts., Philadelphia 40, Pa.
● Connor Engineering Corp., W. B., 114 E. 32nd St., New York 16, N. Y.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.
Continental Diamond Fibre Co., Newark, Del.
Continental Electric Co., Inc., 323 Ferry St., Newark, N. J.
Continental Motors Corp., Muskegon, Mich.
Continental Products Co., 1150 E. 222nd St., Euclid, O.
Continental Rubber Wks., 1902 Liberty Blvd., Erie, Pa.
Continental Steel Corp., 1108 S. Main St., Kokomo, Ind.
Cook, Inc., A. D., Lawrenceburg, Ind.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper-Bessemer Corp., The, 200 Thomas Ave., Mt. Vernon, O.
Cooper & Cooper, 37 Fenn St., Pittsfield, Mass.
Cooper Co., Clark, Palmyra, N. J.
Cooper Sanitary Co., 3601 Ludlow St., Philadelphia, Pa.
Copeland Refrigeration Corp., Sidney O.
Coppus Engineering Corp., 344 Park Ave., Worcester 2, Mass.
Corbman Bros., Inc., 315 N. 7th St., Philadelphia 6, Pa.
Cordo Chemical Co., 34 Smith St., Norwalk, Conn.
Cork Import Corp., 330 W. 42nd St., New York 18, N. Y.
Cork Insulation Co., Inc., 155 E. 44th St., New York, N. Y.
Corley Co., 629 Grove St., Jersey City, N. J.
Corning Glass Works, Corning, N. Y.
Coroaire Heater Corp., The, 1124 Hanna Bldg., Cleveland, O.
Cramer Co., Inc., R. W., The, Centerbrook, Conn.
● Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.
Crane Packing Co., 1801 Belle Plaine Ave., Chicago, Ill.
Crawford Co., 3220 W. 31st St., Chicago 23, Ill.
Crescent Tool Co., 230 Harrison St., Jamestown, N. Y.
Crise Elec. Mfg. Co., 2040 E. Main, Columbus, O.
● Crocker-Wheeler Electric Mfg. Co. Div. Joshua Hendy Iron Works, Ampere 1, N. J.
Croll-Reynolds Engineering Co., Inc., 17 Johns St., New York 7, N. Y.
Croll & Son, Jesse G., 2326-2606 Germantown Ave., Philadelphia, Pa.
Crown Die & Tool Co., 108 N. Jefferson St., Chicago 6, Ill.
● Crown Iron Works, 1229 N. E. Tyler, Minneapolis, Minn.
Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.
Cryer Trap & Valve Co., Inc., 366 Madison Ave., New York 17, N. Y.
Cuno Engineering Corp., 80 S. Vine St., Meriden, Conn.
Curtis & Curtis Co., The, 450 Garden St., Bridgeport, Conn.
● Curtis Refrigerating Machine Div., Curtis Mfg. Co., 1950 Kienlen Ave., St. Louis 20, Mo.
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.
Cyrus Shank Co., 625 W. Jackson Blvd., Chicago 6, Ill.
Dahlquist Mfg. Co., Inc., 628 Somerville Ave., Somerville 43, Mass.
Dahlstrom Machine Works, 5014 N. Kedzie Ave., Chicago 25, Ill.
Dahlstrom Metallic Door Co., S. E. cor. E. Second and Buffalo Sts., Jamestown, N. Y.
Daigger & Co., A., 161 W. Kinzie St., Chicago, Ill.
Dallas Engineering Co., Inc., 200 S. Akard, Dallas, Tex.
Dampney Co. of America, 1243 River St., Hyde Park, Boston 36, Mass.
Danzer Metal Works Co., Box 201, Hagerstown, Md.
Darcoid Co., Inc., 145 Sixth Ave., New York 13, N. Y.
Darling Valve & Mfg. Co., 701 First St., Williamsport, Pa.
Dart Mfg. Co., E. M., 134 Thurbers Ave., Providence 5, R. I.
Davey Compressor Co., Kent, O.
Davidson Co., M. T., 43-53 Keap St., Brooklyn 11, N. Y.
Davidson Hy Duty Roof Fan Co., 213 California St., Newton, Mass.
Davies & Co., Wayne, 326 Pleasant St., Worcester 2, Mass.
Davis & Co., Inc., Dean W., 1006 First St., Kentland, Ind.
Davis Engineering Corp., 1070 E. Grand St., Elizabeth 4, N. J.
Davis Regulator Co., 2546 S. Washtenaw Ave., Chicago 8, Ill.
Davison Chemical Corp., The, 20 Hopkins Place, Baltimore, Md.
Day Co., The, 810-830 Third Ave., N. E., Minneapolis 13, Minn.
Dayton Air Compressor Co., Dayton, O.
Dayton-Dowd Co., 115-17 York St., Quincy, Ill.
Dayton Rubber Mfg. Co., 2345 W. Riverview Ave., Dayton 1, O.
● Dean Brothers Pumps, Inc., 323 W. 10th St., Indianapolis, Ind.
Dean Hill Pump Co., 4000 E. 16th St., Indianapolis, Ind.
Dearborn Chemical Co., 310 S. Michigan Ave., Chicago, Ill.
Debevoise Co., The, 968 Grand St., Brooklyn 6, N. Y.
De Bothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.
Decatur Iron & Steel Co., P. O. Box 72, Decatur, Ala.
● Decatur Pump Co., 2750 Nelson Park Rd., Decatur, Ill.
Defender Instrument & Regulator Co., 308 S. 8th St., St. Louis 2, Mo.
De Laval Steam Turbine Co., 300 Nottingham Way, Trenton 2, N. J.
Delco Appliance Div., General Motors Corp., P. O. Box 230, Rochester 1, N. Y.
Delco Products Div., General Motors Corp., 329 E. First St., Dayton, O.
Delta-Star Electric Co., 2400 Block, W. Fulton St., Chicago, Ill.
Deming Co., 14 Aetna St., Salem, O.
Demuth & Sons, Charles, 245 Elm Place, Mineola, L. I., N. Y.
Dersch, Gesswein & Neuert, Inc., 4849 W. Grand Ave., Chicago, Ill.
Desmond-Stephan Mfg. Co., Urbana, O.
Desolvo Co., The, 31 Terminal Way, Pittsburgh 19, Pa.
Despatch Oven Co., 619 S. E. Eighth St., Minneapolis 14, Minn.
Detroit Air Conditioning Service Co., Inc., 1314 Holden Ave., Detroit 2, Mich.
Detroit Brass & Malleable Works, 100 S. Campbell, Detroit 9, Mich.
Detroit Graphite Co., 550 12th St., Detroit, Mich.
● Detroit Lubricator Co., 5900 Trumbull Ave., Detroit 8, Mich.
Detroit Seamless Steel Tubes Co., c/o Grand River Station, Detroit 8, Mich.
● Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich.
Detroit Steel Products Co., 2250 E. Grand Blvd., Detroit, Mich.
Detroit Stoker Co., Fifth Floor, General Motors Bldg., Detroit, Mich.
DeVilbiss Co., The, 300 Phillips Ave., Toledo 1, O.
DeVine Mfg. Co., Inc., J. P., 909 Shawnee Ave., Mt. Vernon, Ill.
Devoe & Raynolds Co., Inc., 44th St. and 1st Ave., New York 17, N. Y.
Dial Light Co. of America, Inc., 92 West St., New York, N. Y.
Diamond Chain & Mfg. Co., 400 Kentucky Ave., Indianapolis 7, Ind.
Diamond Chemical Products, 17 E. 48th St., New York, N. Y.
Diamond Expansion Bolt Co., Inc., 500 North Ave., Garwood, N. J.
Diamond Mfg. Co., 253 W. Eighth St., Wyoming, Pa.
Diamond Power Specialty Corp., P. O. Box 288, Detroit 31, Mich.
Diceler Corp., The, Gasport, N. Y.
Dick Co., Inc., R. & J., 24-48 Sade St., Passaic, N. J.
Dickinson, Aeolus, 3320 S. Artesian Ave., Chicago 8, Ill.
Diehl Mfg. Co., Finderne Plant, 1106 Finderne Ave., Somerville, N. J.

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Dillon Co., 220-C E. Brady St., Tulsa, Okla.
Dillon Steam Boiler Wks., Inc., D. M., Crocker St., Fitchburg, Mass.
Dixon Crucible Co., Joseph, Wayne & Monmouth Sts., Jersey City, N. J.
Doall Co., The, 254 N. Laurel Ave., Des Plaines, Ill.
Dockson Corp., 3847 Wabash Ave., Detroit, Mich.
Dockstader, S. E., 1128 Munsey Bldg., Washington, D. C.
Dodge Mfg. Corp., 500 S. Union St., Mishawaka, Ind.
Doheny Co., John J., 326 Lake St., Belmont, Mass.
● Dole Valve Co., The, 1933 Carroll Ave., Chicago 12, Ill.
● Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.
Domestic Engine & Pump Co., Shippensburg, Pa.
Dow Chemical Co., The, Midland, Mich.
Dowell, Inc., 529 Kennedy Bldg., Tulsa 3, Okla.
Downingtown Iron Wks., Wallace Ave., Downingtown, Pa.
Downs-Smith Brass & Copper Co., 304-320 E. 45th St., New York, N. Y.
Dracco Corp., 4057 E. 116th St., Cleveland, O.
Dragert Co., Inc., C. H., 237 India St., Brooklyn, N. Y.
● Dravo Corp., Machinery Div., 300 Penn Ave., Pittsburgh 2, Pa.
● Drayer & Hanson, Inc., 738 E. Pico Blvd., Los Angeles 21, Calif.
Dreis & Krump Mfg. Co., 7404 Loomis Blvd., Chicago 36, Ill.
Dresser Mfg. Div., Dresser Industries, Inc., 490 Fisher Ave., Bradford, Pa.
Dri-Steam Products, Inc., 29 Broadway, New York 6, N. Y.
Drying Systems, Inc., 1800 W. Foster Ave., Chicago 40, Ill.
Dry-Zero Corp., Merchandise Mart, Chicago 54, Ill.
Dual Air Fan Co., 711 W. Lake St., Chicago, Ill.
● Dunham Co., C. A., 450 E. Ohio St., Chicago 11, Ill.
Dunn, Inc., Struthers, 1321 Arch St., Philadelphia 7, Pa.
du Pont de Nemours & Co., E. I., Ammonia Dept., Wilmington 98, Del.
du Pont de Nemours & Co., E. I., Electrochemicals Dept., Wilmington 98, Del.
du Pont de Nemours & Co., Inc., E. I., Fabrics & Finishes Dept., Wilmington 98, Del.
Durabla Mfg. Co., 114 Liberty St., New York 6, N. Y.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Duraloy Co., Scottdale, Pa.
Duriron Co., Inc., The, 450 N. Findlay St., Dayton 1, O.
Duro Co., 537 Monument Ave., Dayton, O.
Duro Metal Products Co., 2649 N. Kildare Ave., Chicago, Ill.
Dustlix Corp., 715 N. Van Buren St., Milwaukee, Wis.
Dutton Asbestos & Supply Co., 532 Natoma St., San Francisco, Calif.
Dwyer Mfg. Co., F. W., 565 W. Washington Blvd., Chicago 6, Ill.
Dyer Welder & Engineering Co., 7 E. 19th St., Kansas City 8, Mo.
Dynamic Air Engineering, Inc., 1619 S. Alameda, Los Angeles 21, Calif.
Dzus Fastener Co., Inc., Babylon, N. Y.

● Eagan Co., Walter H., 2336-38 Fairmount Ave., Philadelphia, Pa.
Eagle-Picher Lead Co., American Bldg., Cincinnati 1, O.
Eaglesfield Ventilator Co., 910-20 Dorman St., Indianapolis, Ind.
Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y.
Eastern Engineering Co., 45 Fox St., New Haven, Conn.
Eastern Foundry Co., Boyertown, Pa.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
Eastern Oil Equipment Co., 27 Portland St., Portland 3, Me.
Eastern Stainless Steel Corp., P. O. Box 1975, Baltimore 3, Md.
Eastman Kodak Co Kodak Park, Rochester 4, N. Y.
Eclipse Air Brush Co., Inc., 381 Park Ave., Newark, N. J.
Eclipse Fuel Engineering Co., 707 S. Main St., Rockford, Ill.
Econocol Stoker Div. of Cotta Transmission Corp., 2340 11th St., Rockford, Ill.
Economy Electric Mfg. Co., 4632 W. 21st Pl., Chicago 50, Ill.
Economy Equipment Co., 223 N. Wolcott Ave., Chicago, Ill.
Economy Pumps, Inc., 1000 Weller Ave., Hamilton, O.
Economy Valve Seat Co., 2807-13 Fletcher St., Chicago 18, Ill.
Eddy Stoker Corp., 4717 W. North Ave., Chicago 39, Ill.
Eddy Valve Co., Waterford, N. Y.
Edge Moor Iron Wks., Inc., 30 Rockefeller Plaza, New York, N. Y.
Edison General Electric Appliance Co., Inc., 5600 W. Taylor St., Chicago 44, Ill.
Edison, Inc., Thomas A., Instrument Div., Lakeside Ave., West Orange, N. J.
Edward Valve & Mfg. Co., Inc., 1200 W. 145th St., East Chicago, Ind.
Edwards Mfg. Co., Inc., 337 Eggleston Ave., Cincinnati 2, O.
Ehret Magnesia Co., Valley Forge, Pa.
Eiker Mfg. Co., Ogallala, Nebr.
Eimer & Amend, 635 Greenwich St., New York, N. Y.
Eisler Engineering Corp., 754 S. 13th St., Newark 3, N. J.
Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J.
Electric Air Heater Co., Division of American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.
Electric Arc, Inc., 152 Jelliff Ave., Newark 8, N. J.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., Caledonia & Gillette Sts., La Crosse, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Electric Machinery Mfg. Co., 1331 Tyler St., N. E., Minneapolis 13, Minn.
Electric Sprayit Co., 1415 Illinois Ave., Sheboygan, Wis.
Electric Valve Mfg. Co., Inc., 68 Murray St., New York, N. Y.
● Electrimatic Div., The Simoniz Co., 2100 Indiana Ave., Chicago 16, Ill.
Electroaire Corp., 1455 W. Congress St., Chicago, Ill.
Electrol Mfg. Co., 253 Chestnut St., Passaic, N. J.
Electrovent Fan & Mfg. Co., 812 W. Lake St., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
Elgo Shutter & Mfg. Co., 6970 W. Jefferson Ave., Detroit 17, Mich.
Elliott Co., Jeannette, Pa.
Ellis Drier Co., 2444 N. Crawford Ave., Chicago 39, Ill.
Ellison Draft Gage Co., 214 W. Kinzie St., Chicago 10, Ill.
● Ellsworth Pipe & Supply Co., 1739 W. St. Paul Ave., Milwaukee 3, Wis.
Elsey Metal Specialties Co., 1535 Spruce St., Detroit, Mich.
Emerson Electric Mfg. Co., The, 1847 Washington Ave., St. Louis 3, Mo.
Empire Sheet & Tin Plate Co., N. Bowman St., Mansfield, O.
Empire Ventilation Equipment Co., 35-39 Vernon Blvd., Long Island City, N. Y.
Endura Mfg Corp., 45 N. 4th St., Quakerstown, Pa.
Engelhard, Inc., Charles, 90 Chestnut St., Newark, N. J.
Engineer Co., 75 West St., New York 6, N. Y.
Enterprise Engine & Foundry Co., 2949 18th St., San Francisco 10, Calif.
Erdle Perforating Co., 171 York St., Rochester 11, N. Y.
Ergolyte Mfg. Co., 3627 Lawrence St., N., Philadelphia 40, Pa.
Erie Bolt & Nut Co., Erie, Pa.
Erie City Iron Wks., 1450 East Ave., Erie, Pa.
Erie Tool Wks., 11th & French Sts., Erie 2, Pa.
Ess Instrument Co., Fort Lee, N. J.
Essick Mfg. Co., 1950 Santa Fe Ave., Los Angeles 21, Calif.
Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.
Everhot Products Co., 2059 W. Carroll, Chicago 12, Ill.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Everlasting Valve Co., 49 Fisk St., Jersey City 5, N. J.
Excelsior Leather Washer Mfg. Co., 720-730 Chestnut St., Rockford, Ill.
Excelsior Steel Furnace Co., The, 118 S. Clinton St., Chicago 6, Ill.
Excelsior Tool & Machine Co., 31st & Ridge Ave., East St. Louis, Ill.
● Extended Surface, Inc., 58 Second Ave., Brooklyn 15, N. Y.
Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.

Fafnir Bearing Co., 37 Booth St., New Britain, Conn.
Fairbanks Co., 393 Lafayette St., New York 3, N. Y.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.
Fairmont Aluminum Co., Fairmont, W. Va.
Falcon Equipment Co., 13th St., New Brighton, Pa.
Falstrom Co., Main Ave. & D. L. & W. R. R., Passaic, N. J.
Farley Sleeve & Hanger Co., 3748 E. 71st St., Cleveland, O.
Farquhar Co., Ltd., A. B., Duke St., York, Pa.
Farr Co., 2615 Southwest Dr., Los Angeles 43, Calif.
Farrar & Trefts, 20 Milburn St., Buffalo 12, N. Y.
Farris Engineering Co., Palisades Park, N. J.
● Fedders Mfg. Co., Inc., 81 Tonawanda St., Buffalo 7, N. Y.
Federal Machine & Welder Co., 212 Dana St., Warren, O.
Federal-Mogul Corp., 11031 Shoemaker St., Detroit 13, Mich.
Fee & Mason Mfg. Co., Inc., 81 Beekman St., New York 7, N. Y.
Fee and Stemwedel, Inc., 2210 Wabansia Ave., Chicago 47, Ill.
Felt Products Mfg. Co., 1514 Carroll Ave., Chicago 7, Ill.
Felters Co., Inc., 210 South St., Boston, Mass.
● Fenwal, Inc., 200 Pleasant St., Ashland, Mass.
Ferguson & Lange Foundry Co., 1039 Willow St., Chicago, Ill.
Fern, Ralph, 2517 Boulevard Ave., Scranton 9, Pa.
Ferro-Enamel Corp., Liquid Plastics Div., 4150 E. 56th St., Cleveland 5, O.
Ferro-Nil Corp., 381 Fourth Ave., New York 16, N. Y.
Fibre Conduit Co., Orangeburg, N. Y.
Field Control Div., H. D. Conkey & Co., Mendota, Ill.
Filters, Inc., 1515 Gardena St., P. O. Box 471, Glendale, Calif.
Filtrine Mfg. Co., Inc., 53 Lexington Ave., Brooklyn 5, N. Y.
Fingles, Inc., W. A., Reistertown Rd. at Elgin Ave., Baltimore, Md.
Fireline Stove & Furnace Lining Co., 1800 Kingsbury St., Chicago 14, Ill.
Firemood Machine Wks., Converse, Ind.
Firestone Tire & Rubber Co., S. Main St., Akron, O.
Fir-Tex Insulating Board Co., St. Helens, Ore.
Fischer & Porter Co., 7344 County Line Rd., Hatboro, Pa.
Fish-Schurman Corp., 230 E. 45th St., New York 17, N. Y.
● Fisher Governor Co., 205 S. First Ave., Marshalltown, Ia.
● Fitzgibbons Boiler Co., Inc., 101 Park Ave., New York 17, N. Y.
Flagg & Co., Inc., Stanley G., 1421 Chestnut St., Philadelphia 2, Pa.
Flemm Lead Co., Inc., Bradley Ave. & School St., Long Island City 1, N. Y.
Flexitallic Gasket Co., 8th & Bailey Sts., Camden, N. J.
Flexlock Corp., 411 E. Market St., Akron, O.
Flexo Supply Co., Inc., 4221 Olive St., St. Louis 8, Mo.
Flintkote Co., The, 30 Rockefeller Plaza, New York 20, N. Y.
● Flori Pipe Co., The, 601 E. Red Bud Ave., St. Louis 15, Mo.
Floridin Co., Warren, Pa.
Fluor Corp., Ltd., The, 2500 S. Atlantic Blvd., Los Angeles 22, Calif.
Flynn & Emrich Co., 301 Holliday St., Baltimore 2, Md.
Follansbee Steel Corp., Pittsburgh, Pa.
Ford Roofing Products Co., 111 W. Washington St., Chicago, Ill.
Forman Air Conditioning & Engrg. Co., 345 W. 40th St., New York, N. Y.
Fossum, M. H., 2086 Marshall Ave., St. Paul, Minn.
Foster Engineering Co., 109 Monroe St., Newark, N. J.
Foster Pump Wks., Inc., 46-A Washington St., Brooklyn 1, N. Y.
Foster Wheeler Corp., 165 Broadway, New York 6, N. Y.
Fowler & Wolfe Radiator Co., Oak and Carson Sts., Norristown, Pa.

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Fox Control & Mfg. Co., 3589 E. 93rd St., Cleveland, O.
Foxboro Co., 106 Neponset Ave., Foxboro, Mass.
France Packing Co., 6512 Tacony St., Tacony, Philadelphia 35, Pa.
Frank Heaters, Inc., 521 E. 40th St., Paterson 14, N. J.
● Frederick Iron & Steel Co., E 7th St., Frederick, Md.
Freed Products Co., 1510 Third Ave., Moline, Ill.
Fresh-'nd Air Co., 325 N. Wells, Chicago 10, Ill.
Fretz-Moon Tube Co., Inc., Butler, Pa.
Frick Co., Waynesboro, Pa.
Friez Instrument Div., Bendix Aviation Corp., Towson 4, Md.
Frigidaire Div., General Motors Corp., Dayton, O.
Frost Mfg. Co., S. Henderson St., Galesburg, Ill.
Fuel Savers, Inc., 15th and Herr Sts., Harrisburg, Pa.
Fulflo Specialties Co., Inc., The, Blanchester, O.
Fuller Co., 124 Bridge St., Catasauqua, Pa.
● Fulton Sylphon Co., The, Box 400, Knoxville 4, Tenn.
G. D. S. Machinery & Supply Co., Inc., 101 Walker St., New York, N. Y.
G. M. Mfg. Co., 50 W. 3rd St., New York 12, N. Y.
● G & O Mfg. Co., 138 Winchester Ave., New Haven, Conn.
Gallaher Boiler Co., 3615 LaClede Ave., St. Louis, Mo.
Gallaher Co., The, Owatonna, Minn.
Galv-Weld Products, P. O. Box 37, Sta. D, Dayton 10, O.
Garden City Fan Co., 332 S. Michigan Ave., Chicago 4, Ill.
Gardiner Metal Co., 2514 W. 48th Pl., Chicago 32, Ill.
Gardner-Denver Co., Quincy, Ill.
Garlock Packing Co., 50 Main St., Palmyra, N. Y.
Gates Rubber Co., The, 999 S. Broadway, Denver 17, Colo.
Gatke Corp., 228 N. La Salle St., Chicago, Ill
Gehl Bros. Mfg. Co., West Bend, Wis.
Gehri Co., 1117 Tacoma Ave., Tacoma 3, Wash.
General Air Conditioning Corp., 4415 Appleton St., Cincinnati 9, O.
General Blower Co., 400 N. Peoria St., Chicago 22, Ill.
● General Blower Co., Inc., 5335 Market St., Philadelphia 39, Pa.
General Ceramics Co., Keasbey, N. J.
● General Controls Co., 801 Allen Ave., Glendale 1, Calif.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, 5 Lawrence St., Bloomfield, N. J.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
General Electric Co., Plastics Div., 1 Plastics Ave., Pittsfield, Mass.
General Electric Co., 1 River Rd., Schenectady 5, N. Y.
General Equipment Co., 315 S. Wichita, Wichita, Kans.
● General Fittings Co., 123 Georgia Ave., Providence 5, R. I.
General Furnaces Corp., 90 Broad St., New York 4, N. Y.
General Gas Light Co., 212 N. Park, Kalamazoo 11F, Mich.
General Heating Products Co., 3353 University Ave., Minneapolis, Minn.
General Insulating Products Co., 8821 15th Ave., Brooklyn, N. Y.
General Machinery Co., 3500 Riverside Ave., Spokane 1, Wash.
General Motors Corp., Detroit, Mich.
● General Motors Corp., Moraine Products Div., Dayton 1, O.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
General Sales & Products Co., 242 Saratoga St., Cohoes, N. Y.
General Scientific Equipment Co., 1346 N. Somerset St., Philadelphia 32, Pa.
Genspring, Inc., 500 Fifth Ave., New York, N. Y.
Gerett Corp., M. A., 724 W. Winnebago St., Milwaukee 5, Wis.
Gerstein & Cooper Co., 1 W. Third St., South Boston 27, Mass.
Geuder, Paeschke & Frey Co., W. St. Paul Ave. and N. 15th St., Milwaukee, Wis.
Giant Mfg. Co., South Ave., Council Bluffs, Ia.
Gilbert & Barker Mfg. Co., West Springfield, Mass.
Gilbert & Son, Harry E., 220 Brooklawn Terrace, Bridgeport, Conn.
Gillian Mfg. Co., 7752 Dubois St., Detroit, Mich.
Gilmer Company, L. H., 7230 Keystone St., Tacony, Philadelphia, Pa.
Gisholt Machine Co., 1253 E. Washington Ave., Madison 3, Wis.
Glaser Lead Co., Inc., 31 Wyckoff Ave., Brooklyn, N. Y.
Gleason-Avery, Inc., 27 Clark St., Auburn, N. Y.
Glidden Co., 11001 Madison Ave., Cleveland, O.
Glo Heat Equipment Co., 1951 Grand Central Terminal Bldg., New York 17, N. Y.
Globe Machine & Stamping Co., Div. of Hupp Motor Car Corp., 1250 W. 76th St., Cleveland 2, O.
Globe Steel Tubes Co., 3839 W. Burnham St., Milwaukee, Wis.
Goese Mfg. Co., 2548 N. 18th St., Milwaukee 6, Wis
Goethel Sheet Metal Wks., Alfred, 1910 N. Killian Pl., Milwaukee, Wis.
Goettl Bros. Metal Prod. Co., Central Ave., Phoenix, Ariz.
Goetze Gasket & Packing Co., Inc., 60 Allen Ave., New Brunswick, N. J.
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.
Goldens' Foundry & Machine Co., Columbus, Ga.
Goodrich Co., B. F., 548 S. Main St., Akron 18, O.
Goodyear Tire & Rubber Co., E. Market St., Akron, O.
Gorton Heating Corp., Cranford, N. J.
Goulds Pumps, Inc., Fall St., Seneca Falls, N. Y.
Governair Corp., 617-31 N. W. 2nd St., P. O. Box 1654, Oklahoma City 1, Okla.
Grabler Mfg. Co., 6565 Broadway, Cleveland 5, O.
Graham Transmissions, Inc., 2706 N. Teutonia Ave., Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., 526-528 Monroe Ave., Grand Rapids 2, Mich.
● Grand Rapids Die & Tool Co., 325 Scribner Ave., N. W., Grand Rapids 4, Mich.
Granite City Steel Co., 20th & Madison Ave., Granite City, Ill.
● Grant Wilson, Inc., 141 W. Jackson Blvd., Chicago 4, Ill.
Graton & Knight Co., 356 Franklin St., Worcester 4, Mass.
Graver Tank & Mfg. Co., Inc., 4809 Todd Ave., East Chicago, Ind.
Gray Metal Products, Inc., 30 Carleton St., Rochester, N. Y.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Great National Air Conditioning Co., 2125 N. Harwood St., Dallas 1, Tex.
Green Fire Brick Co., A. P., Mexico, Mo.
Green Fuel Economizer Co., 700 Main St., Beacon, N. Y.
Greene, Tweed & Co., 4377 Bronx Blvd., New York, N. Y.
Greenfield Tap & Die Corp., Sanderson St., Greenfield, Mass.
Greenlee Tool Co., Div. of Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.
Greiner Co., Emil, 161 Sixth Ave., New York, N. Y.
Grief, Edward C., 64 West End Ave., Bogota, N. J.
Griffith Equipment Co., Inc., Los Angeles, Calif.
● Grinnell Co., Inc., 260 W. Exchange, Providence 1, R. I.
Griscom-Russell Co., The, 285 Madison Ave., New York 17, N. Y
Grobet File Corp. of America, 3 Park Pl., New York, N. Y.
Grove Regulator Co., 1190 67th St., Oakland, Calif.
Guardian Electric Mfg. Co., 1400 Washington Blvd., Chicago 7, Ill.
Guardian Utilities Co., 215 E. Michigan St., Michigan City, Ind.
Guild & Garrison, Inc., 43 Keap St., Brooklyn 11, N. Y.
Gustin Bacon Mfg. Co., 1412 W. 12th St., Kansas City, 7, Mo.
Guth Co., Edwin F., 2615 Washington Blvd., St. Louis 3, Mo.
Gylstrom Co., O., 108 W. Wells St., Milwaukee, Wis.
H. & A. Co., 86-100 Leroy Ave., Buffalo 14, N. Y.
H-B Instrument Co., 2518 N. Broad St., Philadelphia 32, Pa.
H. & B. Sales Co., Ltd., 2875 Cherry Ave., Long Beach, Calif.
Haering Co., Inc., D. W., 205 W. Wacker Dr., Chicago 6, Ill.
Hagan Corp., 600 Bowman Bldg., Pittsburgh 30, Pa.
Hague & Co., Inc., Alfred, 227 Thirty-fourth St., Brooklyn, N. Y.
● Haines & Co., William S., 12th & Buttonwood Sts., Philadelphia 23, Pa.
Halowax Products Div., Union Carbide & Carbon Corp., 30 E 42nd St., New York 17, N. Y.
Hamburg Boiler Wks., Inc., Grand St., Hamburg, Pa.
Hamilton Rubber Mfg. Co., Mead St., Trenton, N. J.
Hamer Oil Tool Co., 2919 Gardenia Ave., Long Beach 7, Calif.
Hammett Electric Mfg. Co., 2558 McGee Traficway, Kansas City 8, Mo.
Hammond Brass Wks., Summer Blvd., Hammond, Ind.
Hampton-Cross Co., The, 1014 W. Main St., Louisville, Ky.
Hampton Electric Mfg. Co., Third and Archie Sts., Oakmont, Pittsburgh, Pa.
Hancock Valve Div., Manning, Maxwell & Moore Inc., 11 Elias St., Bridgeport 2, Conn.
Handley Brown Heater Co., 209 E. Washington Ave., Jackson, Mich.
Handy & Harman, 82 Fulton St., New York 7, N. Y.
Hanlon-Waters, 11 N. Cincinnati, Tulsa 1, Okla.
● Hansen Mfg. Co., Inc., Princeton 6, Ind.
Hardinge Oil Burner & Mfg. Co., 1770 Berteau St., Chicago 13, Ill.
Hardy, Inc., Charles, 420 Lexington Ave., New York, N. Y.
Hare Engineering Co., 155 W. Congress St., Detroit 26, Mich.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis.
Harrington & King Perforating Co., 5655 Fillmore St., Chicago 44, Ill.
Harris, A. R., 4546 Hohman Ave., Hammond, Ind.
Harris Calorific Co., The, 5501 Cass Ave., N. W., Cleveland, O.
Harris & Co., Arthur, 210 N. Aberdeen St., Chicago 7, Ill.
Harrisburg Machinery Corp., 7th & Curtin St., Harrisburg, Pa.
Harrisburg Steel Corp., 10th & Herr Sts., Harrisburg, Pa.
Harry Cooling Towers, Inc., 554 W. 48th St., New York 19, N.Y.
Hart & Cooley Mfg. Co., Holland, Mich.
Hart Mfg. Co., The, Hamilton St., Hartford 2, Conn.
Hartmann Co., Chas., 985 Dean St., Brooklyn, N. Y.
Hartzell Propeller Fan Co., P. O. Box 909, Roosevelt Ave., Piqua, O.
Harvey-Whipple, Inc., Springfield, Mass.
Hasco Valve & Machine Co., 1819 W. St. Paul Ave., Milwaukee, Wis.
Haskell Mfg. Co., Wm. H., 20 Commerce St., Pawtucket, R. I.
Hastings Air Conditioning Co., Box 481, 108 S. Colorado Ave., Hastings, Nebr.
Haveg Corp., Newark, Del.
● Hays Corp., 782 E. 8th St., Michigan City, Ind.
Hays Mfg. Co., 801 W. 12th St., Erie, Pa.
Healy Ruff Co., 2255 University Ave., St. Paul, Minn.
Heartley Machine & Tool Co., 900-8 Summit St., Toledo, O.
Heat Transfer Products, Inc., 90 West St., New York 6, N. Y.
Heating Assurance, Inc., 124 E. Augusta St., Spokane, Wash.
Hegeler Zinc Co., P. O. Box 599, Danville, Ill.
Hendley & Whittemore, 6 Blackhawk Blvd., Beloit, Wis.
Hendrick Mfg. Co., 37 Dundaff St., Carbondale, Pa.
Henry Furnace Co., The., Medina, O.
Henry Valve Co., 3260 W. Grand Ave., Chicago 51, Ill.
Henry & Wright Mfg. Co., 760 Windsor St., Hartford, Conn.
Herbert Boiler Co., 2300 Bloomingdale Ave., Chicago, Ill.
Her-Born Engineering & Mfg. Co., 212 Columbus Ave., Sandusky, O.
Herbusch Corp., The, 706 Chestnut St., 210 Title Guaranty Bldg., St. Louis 1, Mo.
Hercules Chemical Co., Inc., 332 Canal St., New York 13, N. Y.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn, N. Y.

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Hercules Float Wks., 200 Franklin St., Springfield, Mass.
Hersey Mfg. Co., South Boston, Mass.
Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.
Hess Warming & Ventilating Co., 1211 S. Western Ave., Chicago, Ill.
Hetzel Roofing Products Co., 67 Maine St., Newark 5, N. J.
Highside Chemicals Co., 195 Verona Ave., Newark 4, N. J.
Hill Diesel Engine Co., Lansing 3, Mich.
Hill, E. Vernon, 6826 W. Highland Ave., Chicago 31, Ill.
Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y.
Hinde & Dauch Paper Co., P.O. Box 861, Sandusky, O.
Hirschman Co., W. F., 1245 McKinley Parkway, Buffalo, N. Y.
Hobart Bros. Co., Troy 1, O.
Hodge Boiler Wks., Sumner St., East Boston 28, Mass.
Hodgman Mfg. Co., 135 Washington St., Taunton, Mass.
Hodgman Rubber Co., Framingham, Mass.
● Hoffman Specialty Co., 1001 York St., Indianapolis 7, Ind.
● Holcomb & Hoke Mfg. Co., 1545 Van Buren, Indianapolis, Ind.
Hollands Mfg. Co., Erie, Pa.
Hollup Corp., Div. of National Cylinder Gas Co., 3357 W. 47th Pl., Chicago, Ill.
Holsclaw Bros., Inc., Evansville 11, Ind.
Holtum Mfg. Co., Freeport, Ill.
● Holtzer-Cabot, Div. First Industrial Corp., 125 Amory St., Boston 19, Mass.
Homestead Valve Mfg. Co., P. O. Box 348, Coraopolis, Pa.
Hoppes Mfg. Co., 850 N. Belmont Ave., N. Springfield, O.
Horn Co., A. C., 43-36 Tenth St., Long Island City, N. Y.
Horton Mfg. Co., 3016 University Ave., S. E., Minneapolis 14 Minn.
Hossfeld Mfg. Co., 460 W. Third St., Winona, Minn.
Hotstream Heater Co., 2363 E. 69th St., Cleveland 4, O.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Hound Packing Co., 4757 E. Ravenswood Ave., Chicago, Ill.
Howard Iron Wks. & Alberger Heater Co., 287 Chicago St., Buffalo 4, N. Y.
Howe Ice Machine Co., 2825 Montrose Ave., Chicago 18, Ill.
Howell Electric Motors Co., Howell, Mich.
Howes-Woods Co., 201 Bridge St., Cambridge, Mass.
Hubbard Co., 1014 Marquette Ave., Minneapolis, Minn.
Hubbell Corp., 319 N. Albany Ave., Chicago, Ill.
Humboldt Mfg. Co., 2016 N. Whipple St., Chicago, Ill.
Hunt & Son, C. B., Salem, O.
Hunter Fan & Ventilating Co., Inc., 400 S. Front St., Memphis, Tenn.
Hunter Machine Co., James, North Adams, Mass.
Hussey & Co., C. G., 2850 Second Ave., Pittsburgh, Pa.
Huyette Co., Inc., Paul B., 401 N. Broad St., Philadelphia 8, Pa.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Hynes Electric Heating Co., West and Clinton Sts., Camden, N. J.

Ice Cooling Appliance Corp., Morrison, Ill.
Ideal Commutator Dresser Co., 1096 Park Ave., Sycamore, Ill.
Ideal Electric & Mfg. Co., E. First & Oak Sts., Mansfield, O.
● Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago 41, Ill.
● Illinois Engineering Co., 2035 S. Racine Ave., Chicago 8, Ill.
● Illinois Iron & Bolt Co., 918 S. Michigan Ave., Chicago 5, Ill.
Illinois Malleable Iron Co., 1801 Diversey Parkway, Chicago 14, Ill.
Illinois Oil Co., 4th Ave. and 24th St., Rock Island, Ill.
● Illinois Testing Laboratories, 420 N. La Salle St., Chicago 10, Ill.
Illinois Zinc Co., 2959 W. 47th St., Chicago, Ill.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.
Imperial Electric Co., 64 Ira Ave., Akron, O.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6, Ill.
Independent Register Co., 3747 E. 93rd St., Cleveland 5, O.
Industrial Engineering Corp., Terre Haute, Ind.
Industrial Mfg. & Engineering Co., 3845 N. Ravenswood Ave., Chicago 13, Ill.
Industrial Research, Lansdowne, Pa.
Industrial Service Laboratories, 7656 W. Forest Home Ave., Milwaukee 14, Wis.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
● Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Inland Steel Co., 38 S. Dearborn St., Chicago 3, Ill.
Inner-Tite Clamp Corp., 18 W. Jersey St., Elizabeth 4, N. J.
Instant Drying Corp., 101 Park Ave., New York, N. Y.
Insto-Gas Corp., 1900 E. Jefferson, Detroit 7, Mich.
Insulite Div. Minnesota and Ontario Paper Co., 500 Baker Arcade Bldg., Minneapolis 2, Minn.
Insul-Wool Insulation Corp., Wichita 12, Kans.
Inter-Coastal Paint Corp., 15th St., and Southern R. R., East St. Louis, Ill.
International Boiler Works, East Stroudsburg, Pa.
International Correspondence Schools, Scranton, Pa.
International Engineering, Inc., 1145 Bolander Ave., Dayton, O.
International Engineering Wks., Inc., Box 71, Framingham, Mass.
International Heater Co., 101 Park Ave., Utica 2, N. Y.
International Moistening Co., 489 S. Main St., Providence, R. I.
International Nickel Co., Inc., The, 67 Wall St., New York 5, N. Y.
International Nutyp Tool Co., 68 W. First St., Oswego, N. Y.
International Register Co., 2620 W. Washington Blvd., Chicago 12, Ill.
International Sales Co., 2045 Evans Ave., San Francisco 24, Calif.
International Steel Co., 1545 Edgar St., Evansville, Ind.
International Vermiculite Co., Girard, Ill.
Iona Ventilator Co., Inc., 2821-29 W. Dauphin St., Philadelphia 32, Pa.
Iowa Paint Mfg. Co., 118-20 Eighth St., Des Moines, Ia.
● Iron Fireman Mfg. Co., 3085 W. 106th St., Cleveland 11, O.
Irvington Varnish and Insulator Co., 6 Argyle Terrace, Irvington 11, N. J.
Iwan Brothers, Inc., 1503 Prairie Ave., South Bend 14, Ind.

Jabsco Pump Co., 8306 Wilshire Blvd., Beverly Hills, Calif.
Jackson Co., Byron, P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif.
Jackson & Church Co., 321 N. Hamilton Ave., Saginaw 6, Mich.
Jacobs Co., B. & J., 1729 John St., Cincinnati, O.
Jaden Mfg. Co., 1601 Second St., Hastings, Nebr.
Jamar Co., Walker, 367 S. First Ave., E. Duluth, Minn.
Jamieson Mfg. Co., 820 Eagle Ford Rd., Dallas, Tex.
● Janette Mfg. Co., 556 W. Monroe St., Chicago 6, Ill.
Jarecki Mfg. Co., 1345 W. 12th St., Erie, Pa.
Jefferson Electric Co., 25th & Madison St., Bellwood, Ill.
● Jefferson Union Co., Inc., Lockport, N. Y.; and Lexington Mass.
Jeffrey Mfg. Co., 859-99 N. Fourth St., Columbus, O.
● Jenkins Bros., 80 White St., New York 13, N. Y.
Jennison Co., 17 Putnam St., Fitchburg, Mass.
Jessop Steel Co., Washington, Pa.
Jewel Mfg. Co., 1841 University Ave., St. Paul 4, Minn.
Joal Mfg. Corp., 2058 Canton St., Toledo, O.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Johnson Bronze Co., 460 S. Mill St., New Castle, Pa.
Johnson Co., Lloyd S., 2241 Indiana Ave., Chicago 16, Ill.
Johnson Co., S. T., 940 Arlington St., Oakland 8, Calif.; 401 N. Broad St., Philadelphia 8, Pa.
Johnson Corp., 892 Wood St., Three Rivers, Mich.
Johnson Fan & Blower Corp., 1320 W. Lake St., Chicago 7, Ill.
Johnson Gas Appliance Co., 520-"E" Ave., N. W., Cedar Rapids Ia.
● Johnson Service Co., 507 E. Michigan St., Milwaukee, Wis.
Johnston Bros., Inc., Ferrysburg, Mich.
Johnston & Chapman Co., 2925 Carroll Ave., Chicago, Ill.
Johnston Co., William W., 115 Bayard St., Dayton, O.
Johnston Tin Foil & Metal Co., The, 6100 S. Broadway, St. Louis 11, Mo.
Jones Foundry & Machine Co., W. A., 4401 Roosevelt Rd., Chicago 24, Ill.
Jones & Laughlin Steel Corp., Third Ave. & Ross St., Pittsburgh 30, Pa.
Jordan & Co., Inc., Paul R., 311 E. South St., Indianapolis 4 Ind.
Justus Steam Trap Co., Napanoch, N. Y.

Kainer & Co., 763 W. Lexington St., Chicago, Ill.
Kaiser Co., H. S., 3336 Franklin Blvd., Chicago, Ill.
Kaltenthaler Co., H. J., 236 Cherry St., Philadelphia 6, Pa.
Kane Mfg. Corp., Kane, Pa.
Kauffman Air Conditioning Corp., 4336 W. Pine Blvd., St. Louis Mo.
Kaufman Co., H. J., The, 13215 Roselawn Ave., Detroit 4, Mich.
Kaye & MacDonald, Inc., 92 Franklin Ave., West Orange, N. J.
Keasbey Co., Robert A., 139-149 W. 19th St., New York, N. Y.
Keasbey & Mattison Co., Butler Ave., Ambler, Pa.
Keckley Co., O. C., 400 W. Madison St., Chicago 6, Ill.
Keeler Co., E., 238 West St., Williamsport 3, Pa.
Keeney Mfg. Co., Main St., Newington, Conn.
Kehm Corp., The, 135 S. La Salle St., Chicago 3, Ill.
Keldur Corp., 420 Lexington Ave., New York 17, N. Y.
Keller Tool Co., P. O. Box 268, Grand Haven, Mich.
Kellogg Co., M. W., The, 225 Broadway, New York 7, N. Y.
Kelly-Koet, Covington, Ky.
Kelvin-White Co., 90 State St., Boston 9, Mass.
Kelvinator Div., Nash-Kelvinator Corp., 14250 Plymouth Rd. Detroit 32, Mich.
Kennard Corp., 4821 Easton Ave., St. Louis 13, Mo.
Kennedy, Inc., David E., 60 Second Ave., Brooklyn, N. Y.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
Kerentoff, G. L., 2218 Reading Rd., Cincinnati 2, O.
Kernchen Co., 103 E. Wacker Drive, Chicago, Ill.
Kerotest Mfg. Co., 2525 Liberty Ave., Pittsburgh 22, Pa.
Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.
● Kewanee Boiler Corp., Franklin St. and "Q" Tracks, Kewanee Ill.
● Key Co., 2700 McCasland, East St. Louis, Ill.
Keystone Asphalt Products Co., 43 E. Ohio St., Chicago, Ill.
Keystone Carbon Co., Inc., St. Marys, Pa.
Kidder Mfg. Co., Inc., J. F., 426 Colchester Ave., Burlington, Vt.
● Kieley & Mueller, Inc., 2013-2033 43rd St., North Bergen, N. J.
Kimball-Krogh Pump Div., Food Machinery Corp., 301 West Ave. 26, Los Angeles, Calif.
Kimberly-Clark Corp., Neenah, Wis.
Kinetic Chemicals, Inc., 10th & Market St., Wilmington 98, Del.
King Engineering Corp., 945 Willard Ave., Ann Arbor, Mich.
King Union Co., Inc., Hillsgrove, R. I.
King Ventilating Co., Box 178, Owatonna, Minn.
Kingsford Foundry & Machine Wks., 264 W. Second St., Oswego, N. Y.
Kingston Products Corp., 1415 N. Webster, Kokomo, Ind.
Kinney Mfg. Co., 3529 Washington St., Boston 30, Mass.
Kirk & Blum Mfg. Co., 2838-52 Spring Grove Ave., Cincinnati, O
Kisco Boiler & Engineering Co., 3732-40 Chouteau Ave., St. Louis, Mo.

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Klauer Mfg. Co., 9th and Washington Sts., Dubuque, Ia.
Klee Co., Geo. B., 2162-6 Dana Ave., Cincinnati 7, O.
Kleenaire Corp., 409 Jefferson St., Stevens Point, Wis.
Kleen-Heet, Inc., 1823 Carroll Ave., Chicago 12, Ill.
Klingerit, Inc., 16-22 Hudson St., New York 13, N. Y.
Klipfel Mfg. Co., 2651 W. Harrison St., Chicago 12, Ill.
Klomparens Lock-Joint Co., 3015 Military Rd., Arlington, Va.
Kluegel & Co., E., 187 W. Kellogg Blvd., St. Paul, Minn.
Knickerbocker Co., 603 Liberty St., Jackson, Mich.
Knight, Maurice A., Kelley Ave., Akron, O.
Knowles Mushroom Ventilator Co., 11 Label St., Montclair, N. J.
Kohler Co., Kohler, Wis.
Kol-Master Corp., 161 Walberg St., Oregon, Ill.
Kopperman & Sons, Joseph, 316 New St., Philadelphia 6, Pa.
Koppers Co., Bartlett Hayward Div., 200 Scott St., Baltimore, Md.
Korfund Co., 48-36 32nd Pl., Long Island City 1, N. Y.
Koven & Bro., L. O., Inc., 154 Ogden Ave., Jersey City, N. J.
Kraissl Co., Inc., The, Terhune and Williams Aves, Hackensack, N. J.
● Kramer Trenton Co., 626 Brunswick Ave., Trenton 5, N. J.
Krehbiel Co., J. H., 425 N. Crawford Ave., Chicago, Ill.
Kresno-Stamm Mfg. Co., 730 Sixth Ave., New York 10, N. Y.
Krez Co., Paul J., 444 N. LaSalle St., Chicago, Ill.
● Krueger Sentry Gauge Co., 109 N. Pearl St., Green Bay, Wis.
Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City, Mich.
● Kuhns Bros. Co., 1800 McCall St., Dayton 8, O.
Kunkle Valve Co., 121 N. Clinton St., Ft. Wayne 2, Ind.
Kwikon Co., 626 W. Jackson Blvd., Chicago, Ill.

L-R Mfg. Co., Blower Div., Torrington, Conn.
La Bour Co., Inc., The, 1301 Sterling Ave., Elkhart, Ind.
Laclede-Christy Clay Products Co., 411 N. Seventh St., St. Louis, Mo.
Laclede Steel Co., Arcade Bldg., Rm. 1317, St. Louis 1, Mo.
Laclede Stoker Co., 4438 Hunt Ave., St. Louis 10, Mo.
La Crosse Steel Roofing & Corrugating Co., 227 Jay St., La Crosse, Wis.
La Crosse Tractor Co., La Crosse, Wis.
● La-Del Conveyor & Mfg. Co., S. Broadway and Mill Ave., New Philadelphia, O.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis. (Milwaukee Suburb).
Lamb & Ritchie Co., 250 Albany St., Cambridge, Mass.
Lammert & Mann Co., 281 N. Wood St., Chicago 12, Ill.
Lamneck Products, Inc., 1025 Lamneck St., Middletown, O.
Lamson & Sessions Co., 1971 W. 85th St., Cleveland, O.
Landis & Gyr, Inc., 104 Fifth Ave., New York 11, N. Y.
Landis Machine, Inc., Fifth and Church Sts., Waynesboro, Pa.
Larkin Coils, Inc., 519 Memorial Dr., S. E., Atlanta 1, Ga.
Larkin Packer Co., 6200 Maple Ave., St. Louis, Mo.
Lastik Products Co., Inc., 1106 Keenan Bldg., Pittsburgh 22, Pa.
● Lau Blower Co., 2001 Home Ave., Dayton 7, O.
Lawler Automatic Controls, 453 N. MacQuesten Pkwy., Mount Vernon, N. Y.
Lawrence Pump & Engine Co., P. O. Box 70, Lawrence, Mass.
Layne & Bowler, Inc., Box No. 215, Hollywood Sta., Memphis 8, Tenn.
Lead Lined Iron Pipe Co., 1 Broadway, Wakefield, Mass.
Leavitt Machine Co., East River St., Orange, Mass.
Lecourtenay Co., 5 Maine St., Newark 5, N. J.
Lee Engineering Co., Union National Bank Bldg., Youngstown 3, O.
Lee Co., K. O., Aberdeen, S. D.
Lee & Son Co., Thomas, 128-132 W. Second St., Cincinnati, O.
● Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Lees, John, Div., Serrick Corp., Muncie, Ind.
Leffel & Co., James, 426 East St., Springfield, O.
Lehigh Fan & Blower Co., Front & Linden Sts., Allentown, Pa.
Lehon Co., 4411 S. Oakley Ave., Chicago, Ill.
Leinweber Fan & Blower Co., 8448 Crandon, Chicago, Ill.
● Leland Electric Co., 1501 Webster St., Dayton 1, O.
Lennox Furnace Co., Marshalltown, Ia., Syracuse, N. Y., and Columbus, O.
Leonard Precision Products Co., 1100 Larson Ave., Garden Grove, Calif.
Leonard Valve Co., Elmwood Station, Providence 7, R. I.
Leslie Co., Valley Brook & Grant Aves., Lyndhurst, N. J.
Leslie Welding Co., 2943 Carroll Ave., Chicago, Ill.
Levow, David, 308 W. 20th St., New York 11, N. Y.
Lewellen Mfg. Co., Columbus, Ind.
Lewin-Mathes Co., Lewin Metals Div., 1195 Chouteau Ave., St. Louis 2, Mo.
Lewis & Co., Inc., Chas. S., 2207 Pine St., St. Louis 3, Mo.
Lewis Laboratories, Inc., Paul, 924 N. Fourth St., Milwaukee, Wis.
Leyman Mfg. Corp., John H. McGowan Co. Div., 1416 First National Bank Bldg., Cincinnati, O.
Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, O.
● Lilie-Hoffman Cooling Towers, Inc., 4239 Duncan Ave., St. Louis, Mo.
Limbert & Co., Geo. B., 570 Fulton St., Chicago 6, Ill.
Lincoln Electric Co., The, 12818 Coit Rd., Cleveland 1, O.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Lindsay & Lindsay, 222 W. Adams St., Chicago 6, Ill.
Linear Packing & Rubber Co., Inc., N. W. Cor. State Rd. & Levick St., Philadelphia 35, Pa.
● Link-Belt Co., 307 N. Michigan Ave., Chicago 1; 300 W. Pershing Rd., Chicago 9, and 2410 W. 18th St., Chicago 8, Ill.; 519 N. Holmes Ave. and 220 S. Belmont Ave., Indianapolis 6, Ind.; 2045 W. Hunting Park Ave., Philadelphia 40, Pa.
Lintern Co., Berea, O.
Lion Mfg. Corp., 2701-11 Belmont Ave., Chicago, Ill.
Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago 23, Ill.
Liquidometer Corp., 37-15 Skillman Ave., Long Island City 1, N. Y.
Lissberger & Son, Inc., Marks, 23-01 Borden Ave., Long Island City, N. Y.
● Little Mfg. Co., M. S., 151 New Park Ave., Hartford 6, Conn.
Littleford Bros., 453 E. Pearl St., Cincinnati 2, O.
Locke Regulator Co., 76 North St., Salem, Mass.
Lockformer Co., The, 4615 Arthington St., Chicago, Ill.
Lockjoint Wood Products Co., 1721 Mildred St., Wichita 7, Kans.
Locknut Corp. of America, 3403 W. 47th St., Chicago, Ill.
Logan Engineering Co., Lawrence & Lamon Ave., Chicago 30, Ill.
Lonergan Co., J. E., 2nd and Race Sts., Philadelphia 6, Pa.
Lonergan Mfg. Co., Albion, Mich.
Long Mfg., Div. Borg-Warner Corp., 12501 Dequindre St., Detroit, Mich.
Lonn Mfg. Co., Inc., 500 N. Dearborn St., Chicago, Ill.
Lookout Boiler & Mfg. Co., Compress St. & Mfrs. Rd., Chattanooga 1, Tenn.
Lord, Hawley & Hamel, 220 W. Cambria, Philadelphia, Pa.
● Lord Mfg. Co., 1633 W. 12th St., Erie, Pa.
Louisville Drying Machinery Co., 351 Baxter Ave., Louisville, Ky.
Lovejoy Flexible Coupling Co., 5024 W. Lake St., Chicago 44, Ill.
Lowell Air Conditioning Corp., Otis Bldg., Philadelphia, Pa.
Lowell Wrench Co., 54 Commercial St., Worcester 8, Mass.
Loyal Knight Stokers, Inc., 800 Scheel St., Belleville, Ill.
Ludlow Valve Mfg. Co., Inc., Foot of Adams St., Troy, N. Y.
Ludowici-Celadon Co., 104 S. Michigan Ave., Chicago, Ill.
Lukens Steel Co., 308 S. First Ave., Coatesville, Pa.
Lumm Co., A. H., 2512 Albion St., Toledo, O.
Lumsden & Van Stone Co., 426 First St., South Boston 27, Mass.
Lundy Co., E. A., 420 Lexington Ave., New York 17, N. Y.
Lunkenheimer Co., Waverly & Beekman Sts., Cincinnati 14, O.
Luzerne Rubber Co., Muirhead Ave., Trenton 9, N. J.
Lynch Mfg. Corp., Defiance, O.
Lynchburg Foundry Co., Peoples Bank Bldg., Lynchburg, Va.
Lyon, Conklin & Co., Inc., McComas & Race Sts., Baltimore 30, Md.

Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J.
Machlett & Son, E., 220 E. 23rd St., New York, N. Y.
Macksons Co., 125 Cedar St., New York, N. Y.
MacLean-Fogg Lock Nut Co., 2653 N. Kildare, Chicago, Ill.
Magirl Foundry & Furnace Wks., P. H., 413 E. Oakland Ave., Bloomington, Ill.
Mahon Co., R. C., 8650 Mt. Elliott Ave., Detroit, Mich.
● Maid-O'-Mist, Inc., 215 N. Aberdeen St., Chicago 7, Ill.
Maintenance Engineering Corp., 3611 Clinton Dr., Houston, Tex.
Majestic Co., 733 Erie St., Huntington, Ind.
Major Controls Sales Div., 12 Norfolk St., Cambridge, Mass.
Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill.
Malleable Iron Fittings Co., Branford, Conn.
Mallory Sales Co., 13904 Lincoln Ave., Dolton, Ill.
Manhattan Perforated Metal Co., Inc., 43-17 37th St., Long Island City, N. Y.
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc., 61 Willett St., Passaic, N. J.
● Manheim Mfg. & Belting Co., Manheim, Pa.
Manitowoc Boiler Wks., 16th & The River, Manitowoc, Wis.
Manufacturers Fin Coil Co., 2505 S. Pulaski Rd., Chicago 23, Ill.
Manufacturers Machine Co., Railroad Ave., North Andover, Mass.
Maple Valley Mfg. Co., First St., Mapleton, Ia.
Maplewood Machinery Co., Inc., 2634 Fullerton Ave., Chicago 47, Ill.
Marathon Electric Mfg. Corp., Cherry and Randolph Sts., P. O. Box 298, Wausau, Wis.
Marble-Card Electric Co., Gladstone, Mich.
Marblehead Lime Co., 160 N. LaSalle St., Chicago, Ill.
● Marley Co., Inc., The, 3001 Fairfax Rd., Kansas City 15, Kans.
Marlin-Rockwell Corp., Jamestown, N. Y.
● Marlo Coil Co., 6135 Manchester Ave., St. Louis 10, Mo.
Marquette Mfg. Co., 401 Johnson St., Minneapolis, Minn.
Marsh Corp., Jas. P., 2073 Southport Ave., Chicago 14, Ill.
Marsh Tritrol Co., Insurance Center Bldg., 330 S. Wells St., Chicago 6, Ill.
Marsh Valve Co., 4th St. & Brigham Rd., Dunkirk, N. Y.
Marshalltown Mfg. Co., 901 E. Nevada, Marshalltown, Ia.
● Martens & Stormoen, 15 Hathaway St., Boston 10, Mass.
Martin, J. O. & C. U., 637 Minna St., San Francisco, Calif.
Martin Fan & Blower Co., 4634 W. 21st Pl., Chicago 50, Ill.
Martin & Sons, H. P., 801 W. 12th St., Owensboro, Ky.
● Martocello & Co., Jos. A., 229 N. 13th St., Philadelphia 7, Pa.
Mason-Neilan Regulator Co., 1190 Adams St., Boston 24, Mass.
Masonite Corp., 111 W. Washington St., Chicago 2, Ill.
Master Electric Co., 126 Davis Ave., Dayton 1, O.
Matthiessen & Hegeler Zinc Co., 9th & Sterling Sts., La Salle, Ill.
Mauck Seamless Copper Tank Corp., Victor, 309 E. Main, Norristown, Pa.
Ma[illegible]rath, Inc., 7309 Union Ave., Cleveland, O.
● Maurey Mfg. Corp., 2915 S. Wabash Ave., Chicago 16, Ill.
● May Oil Burner Corp., Maryland Ave. and Oliver, Baltimore 3, Md.
Mayflower Air-Conditioners, Inc., 5th Floor, Finch Ind. Bldg., St. Paul, Minn.
Mayne Products Co., 324 Harris Bldg., Dayton 2, O.
Mayson Mfg. Co., Inc., 4332 Horatio St., Detroit 10, Mich.
Maysteel Products, Inc., Horicon St., Mayville, Wis.

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● McAlear Mfg. Co., 1901-1909 S. Western Ave., Chicago 8, Ill.
McAuley Trap Co., 405 Penn Ave., Pittsburgh 22, Pa.
McCann Furnace Co., 5005 Euclid Ave., Cleveland 3, O.
● McCord Corp., 2587 E. Grand Blvd., Detroit 11, Mich.
McCorkle Co., D. H., 6th & Bancroft Way, Berkeley 2, Calif.
● McDonnell & Miller, 400 N. Michigan Ave., Chicago 11, Ill.
McKay Co., York, Pa.
McLeod & Henry Co., Inc., Troy, N. Y.
McPherson Furnace & Supply Co., 1805 N. E. Second Ave., Portland 12, Ore.
McQuay, Inc., 1600 Broadway, N. E., Minneapolis 13, Minn.
McQuay-Norris Mfg. Co., Southwest Ave. at Marconi, St. Louis 10, Mo.
McWane Cast Iron Pipe Co., 1201 Vanderbilt Rd., Birmingham 2, Ala.
Mears-Kane-Ofeldt, Inc., 1903-1915 E. Hagert St., Philadelphia, Pa.
Medart Co., 3500 DeKalb, St. Louis, Mo.
Meier Electric & Machine Co., 3525 E. Washington St., Indianapolis, Ind.
Mellish & Murray Co., 1715 Carroll Ave., Chicago 12, Ill.
Merchant & Evans Co., 2035 Washington Ave., Philadelphia 46, Pa.
● Mercoid Corp., The, 4201 Belmont Ave., Chicago 41, Ill.
Merco-Nordstrom Valve Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Meriam Instrument Co., The, 10920 Madison Ave., Cleveland 2, O.
Mesker & Co., Geo. L., 400 N. W. First St., Evansville 8, Ind.
Metal Products Fabricating Co., 119 Kansas St., San Francisco, Calif.
Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Metallo Gasket Co., 16 Bethany St., New Brunswick, N. J.
Metropolitan Refining Co., Inc., 23-28 50th Ave., Long Island City, N. Y.
● Mettler Co., Lee B., 406 S. Main St., Los Angeles 13, Calif.
Meyer & Bro. Co., F., 1313 S. Adams St., Peoria 2, Ill.
Meyer Furnace Co., The, Peoria 2, Ill.
Meyer Mfg. Co., 2536 Fourteenth St., Detroit 16, Mich.
Michell Air Conditioning Co., Inc., 1725 State St., Schenectady, N. Y.
Michigan Pipe Co., 503 Phoenix Bldg., Bay City, Mich.
Micro Products Co., 20 N. Wacker Dr., Chicago, Ill.
Micro Switch Corp., 1 E. Spring St., Freeport, Ill.
Middleton Mfg. & Sales Co., 125 N. First St., Minneapolis, Minn.
Midland Paint & Varnish Co., 9115 Reno Ave., Cleveland, O.
Mid-States Equipment Co., 2429 S. Michigan Ave., Chicago 16, Ill.
● Midwest Piping & Supply Co., Inc., Second and Barry St., St. Louis 4, Mo.
Milburn Co., Alexander, 1426 W. Baltimore St., Baltimore, Md.
Milcor Steel Co., S. 41st & Burnham Sts., Milwaukee 4, Wis.
Miller Electric Mfg. Co., Inc., 905 N. Meade St., Appleton, Wis.
Miller Heat-O-Meter Co., 4385 Green Bay Ave., Milwaukee 12, Wis.
Millers Falls Co., 57 Wells St., Greenfield, Mass.
Mills Corp., Elmer E., 153-159 W. Huron St., Chicago 10, Ill.
Mills Industries, Inc., 4110 W. Fullerton Ave., Chicago, Ill.
Milwaukee Gas Specialty Co., 2025 W. Clybourn St., Milwaukee, Wis.
Milwaukee Valve Co., S. Burrell St. at E. Hayes Ave., Milwaukee, Wis.
Mineral Insulation Co., 103rd & Southwest Highway, Chicago Ridge, Ill.
● Minneapolis-Honeywell Regulator Co., 2701 Fourth Ave., South, Minneapolis 8, Minn.
Minn-Kota Foundry & Mfg. Co., 201 Second St., N., Fargo, N. D.
Misener Mfg. Co., Inc., 326 E. Washington St., Syracuse 2, N. Y.
Mississippi Glass Co., 200 Fifth Ave., New York 10, N. Y.
Mitchell & Smith, Inc., 9507 Copeland Ave., Detroit 17, Mich.
Modern Engineering Co., 3411 Pine Blvd., St. Louis 3, Mo.
● Modine Mfg. Co., 1772 Racine St., Racine, Wis.
Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Moeschl-Edwards Corrugating Co., Inc., P. O. Box 1115, Cincinnati, O.
Moloch Foundry & Machine Co., Kaukauna, Wis.
Monarch Mfg. Works, Inc., Salmon & Westmoreland Sts., Philadelphia 34, Pa.
Monash-Younker Co., 1315 W. Congress St., Chicago, Ill.
Moncrief Furnace Co., P. O. Box 1673, Atlanta 1, Ga.
Monitor Controller Co., The, 51 S. Gay St., Baltimore 2, Md.
Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo.
Monsanto Chemical Co., Merimac Div., Everett, Mass.
Montag Stove & Furnace Wks., 2011 N. Columbia Blvd., Portland 3, Ore.
Montgomery Bros., 61 Fremont St., San Francisco, Calif.
Moore Products Co., H. and Lycoming Sts. Philadelphia, Pa.
Moore Steam Turbine Div., Worthington Pump & Machinery Corp., Wellsville, N. Y.
Moran Flexible Steam Joint Co., 217 W. Main St., Louisville, Ky.
Morehead Mfg. Co., 2455 W. Warren Ave., Detroit 8, Mich.
Morey & Jones, Ltd., 922 S. Hemlock St., Los Angeles 21, Calif.
Morris Machine Wks., 50 E. Genesee St., Baldwinsville, N. Y.
Morrison Products, Inc., E. 168th St. and Waterloo Rd., Cleveland 10, O.
Morse Chain Co., Turner Pl., Ithaca, N. Y.
● Mortell Co., J. W. Kankakee, Ill.
Motex Metal Process Corp., 4473-4475 W. Jefferson Ave., Detroit, Mich.
Mouat Vapor Heating Co., The, 1246-1254 W. 4th St., Cleveland 13, O.
Mountain States Equipment Co., 1238 Speer Blvd., Denver 4, Colo.
● Mueller Brass Co., Port Huron, Mich.
Mueller Co., 512 W. Cerro Gordo St., Decatur 70, Ill.
● Mueller Furnace Co., L. J., 2005 W. Oklahoma Ave., Milwaukee 7, Wis.
Mueller Steam Specialty Co., Inc., 40-20 22nd St., Long Island City, N. Y.
Multi-Cell Sales Corp., 3420 Nicollet Ave., Minneapolis 8, Minn.
Muncie Gear Wks., Inc., 700 N. Wysor, Muncie, Ind.
● Mundet Cork Corp., 65 S. 11th St., Brooklyn 11, N. Y.
Mundt & Sons, Charles, 53 Fairmount Ave., Jersey City 4, N. J.
Munn & Steele, Inc., 130 Lister Ave., Newark 5, N. J.
Murray Iron Wks. Co., 1106 Washington St., Burlington, Ia.
● Murray Mfg. Co., D. J., 1002-24 Third St., Wausau, Wis.
Mutual Chemical Co. of America, 270 Madison Ave., New York 16, N. Y.
Myers & Bro. Co., F. E., The, Ashland, O.
Myers Electric Co., Inc., 410 Third Ave., Pittsburgh 19, Pa.
● Nash Engineering Co., 307 Wilson Ave., South Norwalk, Conn.
Nason Co., 7663 Epworth Blvd., Detroit 4, Mich.
National Airoil Burner Co., Inc., 1284 E. Sedgley Ave., Philadelphia 34, Pa.
National Aluminate Corp., 6615 W. 66th Pl., Chicago, Ill.
National Brass Co., 1603 Madison Ave., Grand Rapids 2, Mich.
National Carbon Co., 30 E. 42nd St., New York 17, N. Y.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
National Engineering & Mfg. Co., 213 W. 19th St., Kansas City, Mo.
National Engineering Products, Inc., Commerce and Savings Bldg., Washington, D. C.
National Gypsum Co., Delaware Ave., Buffalo, N. Y.
● National Heater Co., 401 Essex Bldg., Minneapolis 2, Minn.
National Lead Co., 111 Broadway, New York 6, N. Y.
National Machine Gas Burners, Div. of Mid-Continent Metal Products Co., 122 S. Michigan Ave., Chicago 3, Ill.
National Machine Wks., 122 S. Michigan Ave., Chicago, Ill.
National Mfg. Corp., 151 Fillmore Ave., Tonawanda, N. Y.
National Mfg. & Engineering Co., 1441 Brooklyn Ave., Detroit, Mich.
National Metal Fabricators, 2138 S. Sawyer, Chicago 23, Ill.
National Metal Products Corp., 21 N. Loomis St., Chicago, Ill.
National Meter Co., 4221 First Ave., Brooklyn 32, N. Y.
National Pipe Bending Co., 122 River St., New Haven 13, Conn.
National Radiator Co., The, 221 Central Ave., Johnstown, Pa.
National Safety Device Co., 1039 N. Crosby St., Chicago 10, Ill.
National Steam Pump Co., 701 W. Johnson St., Upper Sandusky, O.
National Time & Signal Corp., 600 E. Milwaukee Ave., Detroit, Mich.
National Tube Co., United States Steel Corp. Subsidiary, Frick Bldg., Pittsburgh 19, Pa.
National Valve & Mfg. Co., 3101 Liberty Ave., Pittsburgh 1, Pa.
Naugatuck Mfg. Co., Union City, Conn.
Naylor Pipe Co., 1251 E. 92nd St., Chicago 19, Ill.
Nebel Mfg. Co., P. O. Box 3942, Shaker Sta., Cleveland, O.
Neemes Foundry, Inc., 216 First St., Troy, N. Y.
Nelson Chemical Pumps, Box 2235, Casper, Wyo.
Nelson Co., 2604 Fourth Ave., Detroit, Mich.
● Nelson Corp., Herman, 1824 Third Ave., Moline, Ill.
Nelson Mfg. Co., B. F., 401 Main St., N. E., Minneapolis 13, Minn.
● Nelson Specialty Welding Equipment Corp., 440 Peralta Ave., San Leandro, Calif.
Neptune Meter Co., 50 W. 50th St., New York 20, N. Y.
● Nesbitt, Inc., John J., State Rd. & Rhawn St., Philadelphia 36, Pa.
Nevinger Mfg. Co., Inc., Greenville, Ill.
New Albany Machine Mfg. Co., E. 10th & Water Sts., New Albany, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
● New England Cooling Tower Co., 32 Cambridge St., Charles Sta., Boston 29, Mass.
New Haven Copper Co., Seymour, Conn.
New Jersey Zinc Sales Co., Front & Fletcher Sts., New York N. Y.
New York Air Valve Corp., 611-621 Broadway, New York, N. Y.
New York Blower Co., 3155 Shields Ave., Chicago 16, Ill.
New York Brass Foundry, 405 Broome St., New York, N. Y.
Newark Wire Cloth Co., 351 Verona Ave., Newark 4, N. J.
Newman Brothers, Inc., 666 W. Fourth St., Cincinnati, O.
Newman Co., Inc., I. C., 6 E. 45th St., New York, N. Y.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Ninth & Lowell Sts., Newport, Ky.
Niagara Blower Co., 6 E. 45th St., New York 17, N. Y.
Niagara Machine & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.
Nice Ball Bearing Co., 30th and Nicetown Lane, Philadelphia 40, Pa.
Nicholson & Co., W. H., 12 Oregon St., Wilkes-Barre, Pa.
Niles Rolling Mill Co., Niles, O.
Noera Mfg. Co., Div. Chase Brass & Copper Co., Waterbury 91, Conn.
Norgren Co., C. A., 222 Santa Fe Dr., Denver, Colo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Norristown Magnesia & Asbestos Co., Washington St., Norristown, Pa.
North American Fibre Products Co., The, Standard Bldg., Cleveland 13, O.
North American Mfg. Co., 2910 E. 75th, Cleveland, O.
North American Phillips Co., Inc., 100 E. 42nd St., New York 17, N. Y.
North Penn Co., 72 Fifth Ave., New York, N. Y.

● Advertisement in this issue. See Index to Advertisers, page 350.

Northern Blower Co., 6409 Barberton Ave., Cleveland 2, O.
Northern Equipment Co., 1945 Grove Drive, Erie 6, Pa.
Northern Indiana Brass Co., 935 Plum St., Elkhart, Ind.
Northern Steel & Stoker Corp., 3100 Prospect Rd., Peoria, Ill.
Northern Weatherstrip Co., 367 S. First Ave., E. Duluth, Minn.
Northwest Foundry & Furnace Co., 2345 S. E. Gladstone St., Portland 2, Ore.
Northwest Lead Co., 2700 16th Ave., S.W., Seattle 4, Wash.
Norwin Co., E. Album St., Freeport, Ill.
Norwood Filtration Co., The, N. Maple St., Florence, Mass.
Nu-Way Corp., 2416 4th Ave., Rock Island, Ill.
Nye Tool & Machine Co., 4120-30 Fullerton Ave., Chicago 39, Ill.

Oakite Products, Inc., 22 Thames St., New York 6, N. Y.
Oberdorfer Brass Co., M. L., 2307 Thompson Rd., Syracuse, N. Y.
O'Brien Steam Specialty Co., 205 Harrison St., Syracuse 2, N. Y.
O'Brien Varnish Co., South Bend, Ind.
Ohio Brass Co., 380 N. Main St., Mansfield, O.
Ohio Electric Mfg. Co., 5925 Maurice Ave., Cleveland 4, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Works & Foundry Co., 2735 Colerain Ave., Cincinnati 25, O.
Ohio Pipe Bending & Machine Co., 3900-3910 Trent Ave., Cleveland 9, O.
Ohio Products Co., 16113 Munn Rd., Cleveland, O.
Ohl & Son, George A., 159 Oraton St., Newark, N. J.
Ohmlac Paint & Refining Co., 6550 S. Central Ave., Chicago, Ill.
Oil Heat Master National Sales, 4269-81 Park Ave., New York 57, N. Y.
Oil Well Supply Co., Oil City, Pa.
Olsen Testing Machine Co., Tinius, 12th and Buttonwood Sts., Philadelphia, Pa.
O'Malley Valve Co., Edward, 231 E. 95th St., Chicago, Ill.
O'Neil Irwin Mfg. Co., 316 Eighth Ave., S., Minneapolis 15, Minn.
Ormsby-Osterman, Inc., 3631 Cass Ave., St. Louis, Mo.
Orr & Sembower, Inc., Box 1138, Reading, Pa.
Osborn Co., The J. M. & L. A., 1541 E. 38th St., Cleveland 14, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Oster Mfg. Co., 2057 E. 61st Pl., Cleveland 3, O.
Ostlind Valve, Inc., 601 N. E. 28th Ave., Portland 12, Ore.
OverSpred Stoker Co., 77 W. Washington St., Suite 1702, Chicago 2, Ill.
● Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo 1, O.
Ozalid Products Div., General Aniline & Film Corp., Ansco Rd., Johnson City, N. Y.
Ozone Air Co., 928 Cherry St., S.E., Grand Rapids, Mich.

Pacific Lumber Co., The, 100 Bush St., San Francisco 4, Calif.
Pacific Pump Works, 5716 Bickett St., Huntington Park, Calif.
Pacific States Felt & Mfg. Co., Inc., 845 Howard St., San Francisco, Calif.
Pacific Steel Boiler Div., United States Radiator Corp., 1500 United Artists Bldg., Detroit 31, Mich.
Packless Metal Products Corp., 31 Winthrop Ave., New Rochelle, N. Y.
Page Steel & Wire, Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Paine Co., 2951 W. Carroll Ave., Chicago 12, Ill.
Pains Fireworks Display Co., Inc., 11 Park Pl., New York 7, N. Y.
Palmer Co., 2501 Norwood Ave., Cincinnati (Norwood) 12, O.
Palmer Electric Co., 20 Sproat St., Detroit, Mich.
● Palmer Mfg. Corp., Phoenix, Ariz.
Palnut Co., 73 Cordier St., Irvington, N. J.
Pan-American Engineering Co., 820 Parker St., Berkeley, Calif.
Pangborn Corp., Pangborn Blvd., Hagerstown, Md.
Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.
Paragon-Revolute Corp., 61 South Ave., Rochester 4, N. Y.
Paramount Products Co., 545 Fifth Ave., New York, N. Y.
Parker Appliance Co., The, 17325 Euclid Ave., Cleveland 12, O.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Parkersburg Iron & Steel Co., Parkersburg, W. Va.
Parks-Cramer Co., P.O. Box 444, Fitchburg, Mass.
Patent Novelty Co., 312 Eighth St., Fulton, Ill.
Patrol Valve Co., The, 2310 E. Superior Ave., Cleveland 14, O.
Patten Co., J. V., 500 De Kalb Ave., Sycamore, Ill.
Patterson-Ballagh Corp., 1900 E. 65th St., Los Angeles, Calif.
Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Payne Furnace & Supply Co., Inc., 336-338 N. Foothill Rd., Beverly Hills, Calif.
Peabody Engineering Corp., 580 Fifth Ave., New York 19, N. Y.
Pease Co., C. F., The, 2601 W. Irving Park Rd., Chicago, Ill.
Peck & Harvey, 4327 W. Addison St., Chicago, Ill.
Peck, Stow & Wilcox Co., Center St., Southington, Conn.
Pecora Paint Co., Inc., 4th St. and Penna. R. R., Philadelphia 40, Pa.
● Pedrick Tool & Machine Co., 3640 N. Lawrence St., Philadelphia 40, Pa.
Peerless of America, Inc., Marion, Ind.
● Peerless Electric Co., 3021 W. Market St., Warren, O.
Peerless Mfg. Corp., 1400 W. Ormsby St., Louisville, Ky.
● Peerless Pump Div., Food Machinery Corp., 301 West Ave. 26, Los Angeles 31, Calif.
Peerless Unit Ventilation Co., Inc., 810 Union Ave., Bridgeport, Conn.
Penberthy Injector Co., 1242 Holden Ave., Detroit 2, Mich.
● Penn Electric Switch Co., Goshen, Ind.
● Penn Galvanizing Co., 2199 Tioga St., Philadelphia, Pa.
Penn Mfg. Corp. of Washington, Pa., 380 W. Chestnut St., P.O. Box 484, Washington, Pa.
Penn Ventilating Co., 3252 Goodman St., Philadelphia, Pa.
Pennsylvania Engineering Wks., 526 S. Jefferson St., New Castle, Pa.
Pennsylvania Flexible Metallic Tubing Co., 72nd St. and Powers Lane, Philadelphia 42, Pa.
Pennsylvania Forge Co., Milnor & Bleigh Sts., Philadelphia, Pa.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Pennsylvania Salt Mfg. Co., Widener Bldg., Philadelphia 7, Pa.
%-Proportioneers, Inc.%, 9 Codding St., Providence 1, R. I.
Perfect Circle Co., The, Hagerstown, Ind.
Perfection Grate & Stoker Co., 4 Fisk Ave., Springfield 7, Mass.
Perfection Refrigeration Parts Co., Harvey, Ill.
Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.
Perkins Machine Co., 4 Perkins Ave., Warren, Mass.
Perkins & Son, Inc., B. F., Chicopee St., Holyoke, Mass.
Permatex Co., Inc., 1716-1720 Avenue Y, Brooklyn 29, N. Y.
Permutit Co., 330 W. 42nd St., New York 18, N. Y.
Pernot & Rich, Inc., 2546 San Fernando Rd., Los Angeles 41, Calif.
Peters-Dalton, Inc., 628 E. Forest Ave., Detroit 1, Mich.
● Petroleum Heat & Power Co., Stamford, Conn.
Petrometer Corp., 1 Star Sq., Long Island City, N. Y.
Pfening Co., Fred D., The, 1075 W. 5th Ave., Columbus 8, O.
Phelps Dodge Copper Products Corp., British American Tube Div., 40 Wall St., New York, N. Y.
Phelps Mfg. Co., 801 Thomas St., Little Rock, Ark.
Philadelphia Gear Works, Inc., Erie Ave. & G St., Philadelphia 34, Pa.
Philadelphia Pipe Bending Co., 4135-65 N. Fifth St., Philadelphia 40, Pa.
Philadelphia Thermometer Co., 915 Filbert St., Philadelphia, Pa.
Philco Corp., Tioga and C Sts., Philadelphia 34, Pa.
Phillips & Co., H. A., 3255 W. Carroll Ave., Chicago, Ill.
Phillips Cooling Tower Co., Inc., 114 Liberty St., New York 6, N. Y.
Phoenix Brass Fittings Corp., Colt St. & Chancellor Ave., Irvington 11, N. J.
Phoenix Ice Machine Co., 2711 Church St., Cleveland, O.
Phoenix Ventilator Co., Inc., 1665 63rd St., Brooklyn, N. Y.
Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.
Pick Mfg. Co., West Bend, Wis.
Pier Equipment Mfg. Co., 1440 Milton St., Benton Harbor, Mich.
Pierce Butler Radiator Corp., 701 Nichols Ave., Syracuse 6, N. Y.
Pierce Co., Wm. B., The, 133 S. Division, Buffalo 3, N. Y.
Pilley Brush Co., Fort Madison, Ia.
Pines Engineering Co., Inc., 650 Prairie St., Aurora, Ill.
Pioneer Heat Regulator Div., Master Electric Co., The, 100 Davis Ave., Dayton, O.
Pioneer Roofing & Sheet Metal Co., 226 N. Main St., Muskogee, Okla.
Pipe Fabrication Institute, 1108 Clark Bldg., Pittsburgh, Pa.
Pipe & Tube Products, Inc., 451 Communipaw Ave., Jersey City 4, N. J.
Pittsburgh Brass Mfg. Co., 3155 Penn Ave., Pittsburgh, Pa.
Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Pittsburgh Lectrodryer Corp., P.O. Box 1766, Pittsburgh 30, Pa.
Pittsburgh Pipe Coil & Bending Co., 61 Bridge St., Etna, Pa.
Pittsburgh Piping & Equipment Co., 43rd St. & A. V. R. R., Pittsburgh, Pa.
Pittsburgh Plate Glass Co., 2000 Grant Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Pittsburgh Tube Co., Hagan Bldg., 323 Fourth Ave., Pittsburgh 22, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Pittsburgh Water Heater Corp., Box 4452, Pittsburgh 5, Pa.
Plant Rubber & Asbestos Works, 537 Brannan St., San Francisco 7, Calif.
Plastergon Wall Board Co., Philadelphia Ave., Buffalo 7, N. Y.
Plastic Products Co., 6475 Georgia Ave., Detroit 11, Mich.
Pleasantaire Corp. of America, Tower Bldg., Washington 5, D. C.
Plibrico Jointless Firebrick Co., 1800 Kingsbury St., Chicago 14, Ill.
Plumb Mfg. Co., 1925 Dwyer Ave., Utica 3, N. Y.
Plummer Spray Equipment Co., 700 Filmore St., Napoleon, O.
Plymouth Industries, Inc., 1932 Harrison Ave., Plymouth, Ind.
Pocahontas Fuel Co., Inc., Stoker Div., 340 E. 131st St., Cleveland 8, O.
Poe Co., C. W., The, Mayfield at Lee, Cleveland 18, O.
Pomona Pumps, Fairbanks, Morse & Co., 206 E. Commercial St., Pomona, Calif.
Poole Foundry & Machine Co., 1700 Union Ave., Woodberry, Baltimore, Md.
● Porter & Co., Inc., H. W., 825 Frelinghuysen Ave., Newark 5, N. J.
Powell Co., Wm., The, 2525 Spring Grove Ave., Cincinnati 22, O.
Power Piping Div., Blaw Knox Co., 829 Beaver Ave., Pittsburgh, Pa.
Powermatic Ventilator Co., 4019 Prospect Ave., Cleveland 3, O.
● Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.
Practical Instrument Co., 2717 N. Ashland Ave., Chicago, Ill.
Prat-Daniel Corp., Port Chester, N. Y.
Precision Control Co., 899 Bryant St., San Francisco, Calif.
Precision Scientific Co., 1750 N. Springfield Ave., Chicago, Ill.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.
Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23, N. Y.
Premier Furnace Co., Box 150, Dowagiac, Mich.
Presstite Engineering Co., 3900 Chouteau St., St. Louis, Mo.
Pritchard & Co., J. F., Fidelity Bldg., Kansas City, Mo.
Proctor & Schwartz, Inc., 7th St. and Tabor Rd., Philadelphia 20, Pa.
Propellair, Inc., 1345 Lagonda Ave., Springfield, O.
Protected Steel Products Co., McAdams Ave., Washington, Pa.
Protective Coatings, Inc., P. O. Box 56, Stratmoor Station, Detroit 27, Mich.

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● Prox Co., Inc., Frank, 1201 S. First St., Terre Haute, Ind.
Puhl & Hepper Mfg. Co., Inc., 6400 W. Florissant Ave., St. Louis 20, Mo.
Pure Carbonic, Inc., 60 E. 42nd St., New York 17, N. Y.
Pyle-National Co., The, 1334 N. Kostner Ave., Chicago 51, Ill.
Pyott Foundry & Machine Co., 328 N. Sangamon St., Chicago, Ill.
Pyrolite Products Co., 1221-1231 W. 74th St., Cleveland 2, O.
Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y.

Quaker City Iron Wks., Allegheny & Tulip Sts., Philadelphia 34, Pa.
Quaker Rubber Corp., Comly & Milnor Sts., Philadelphia 24, Pa.
Quickwork Div., Whiting Corp., Harvey, Ill.
Quiet Heet Mfg. Co., 135 New Jersey R. R. Ave., Newark, N. J.
Quigley Co., Inc., 527 Fifth Ave., New York 17, N. Y.
Quimby Pump Div., H. K. Porter Co., Inc., 340 Thomas St., Newark 5, N. J.

R-S Products Corp., Germantown Ave. at Wayne Junction, Philadelphia 44, Pa.
R. U. V. Engineering Corp., South Norwalk, Conn.
Radiator Specialty Co., 1722 Dowd Rd., Charlotte 1, N. C.
Rafter Machine Co., 259 Stephens St., Belleville, N. J.
Raisler Corp., Grimes Sprinkler Div., 129 Amsterdam Ave., New York, N. Y.
Ramsey Chain Co., Inc., 1029 Broadway, Albany, N. Y.
Ramtite Co., The, 2563 W. 18th St., Chicago 8, Ill.
Ranco, Inc., 601 W. 5th Ave., Columbus 1, O.
● Randall Graphite Products Corp., 609 W. Lake St., Chicago 6, Ill.
Ransome Machinery Co., Subsidiary of Worthington Pump & Machinery Corp., Dunellen, N. J.
Ravena Iron Co., Ravena, N. Y.
Rawlplug Co., Inc., The, 98 Lafayette St., New York, N. Y.
Ray Oil Burner Co., 401-499 Bernal Ave., San Francisco 12, Calif.
Rayfield Co., C. L., 2010-18 S. Halsted St., Chicago 8, Ill.
Raymond Pulverizer Div., Combustion Engineering Co., 1324 N. Branch St., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Red Jacket Mfg. Co., Davenport, Ia.
Red Spot Electric Co., 7405 S. Tacoma Way, Tacoma 9, Wash.
Redmond Co., A. G., Owosso, Mich.
Reed Unit-Fans, Inc., 1001 St. Charles Ave., New Orleans 8, La.
Reeves Pulley Co., 1000 N. Wilson St., Columbus, Ind.
Reeves Steel & Mfg. Co., Dover, O.
Refinite Corp., Refinite Bldg., Omaha 8, Neb.
Refractory & Insulation Corp., 120 Wall St., New York 5, N. Y.
Refrigeration Appliances, Inc., 917-923 W. Lake St., Chicago Ill.
Refrigeration Economics Co., Inc., 1232 Second St., N. E., Canton 4, O.
Rega Mfg. Co., 79 Mt. Hope Ave., Rochester 7, N. Y.
Register & Grille Mfg. Co., Inc., 70 Berry St., Brooklyn, N. Y.
Reichert Float & Mfg. Co., 2238 Smead Ave., Toledo, O.
Reif-Rexoil, Inc., 37-41 Carroll St., Buffalo, N. Y.
Reilly Tar & Chemical Corp., 1615 Merchants Bank Bldg., Indianapolis 4, Ind.
Reimuller Bros. Co., 9400 Belmont Ave., Franklin Park, Ill.
Reiner & Campbell Co., Inc., 667 Norwood Terrace, Elizabeth 2, N. J.
Reliable Perforating Co., 2047 N. Wood St., Chicago, Ill.
Reliable Sheet Metal Engineering Co., 4334-50 S. Knox, Chicago, Ill.
Reliance Automatic Lighting Co., 1929 Mead St., Racine, Wis.
Reliance Electric & Engineering Co., Ivanhoe Rd., Cleveland 10, O.
Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, O.
Reliance Refrigerating Machine Co., 3401 N. Kedzie Ave., Chicago, Ill.
Remco Products Corp., State and Hay Sts., York, Pa.
Rempe Co., 340 N. Sacramento Blvd., Chicago 12, Ill.
Rensselaer Valve Co., Ontario St., Cohoes, N. Y.
Reps Tool Co., Inc., 99 Wall St., New York 5, N. Y.
Republic Flow Meters Co., 2240 Diversey Pkwy., Chicago, Ill.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
● Republic Steel Corp., Republic Bldg., Cleveland 1, O.
Republic Steel Corp., Bolt & Nut Div., 1970 Carter Ave., Cleveland 13, O.
Research Corp., Chrysler Bldg., New York 17, N. Y.
● Research Products Corp., 1015 E. Washington Ave., Madison 3, Wis.
Resisto Pipe & Valve Co., 262 Bridge St., East Cambridge, Mass.
Resistoflex Corp., Belleville 9, N. J.
● Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Rex Clay Products Co., 14414 Dexter Blvd., Detroit, Mich.
Reynolds Electric Co., 2603 W. Congress St., Chicago 12, Ill.
Reynolds Mfg. Co., The, 412 Prospect St., N. E., Grand Rapids, Mich.
Reynolds Mfg. Co., Inc., Springfield, Mo.
Reynolds Metals Co., Reynolds Metals Bldg., Richmond 19, Va.
● Reznor Mfg. Co., Mercer, Pa.
● Rhoads & Sons, J. E., 35 N. Sixth St., Philadelphia 6, Pa.
Rhode Island Fittings Co., Hillsgrove, R. I.
Rhode Island Humidifier & Ventilating Co., 99 Chauncy St., Boston 11, Mass.
Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.
Richmond Engineering Co., Inc., 7th and Hospital Sts., Richmond, Va.
Richmond Fireproof Door Co., Northwest F St., Richmond, Ind.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
● Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, O.
● Ridge Tool Co., Clark St., Elyria, O.
Rid-Sludge Chemical Co., 1316 Third St., N., Minneapolis 11, Minn.
Riggin Metal Products, Inc., Box 267, Kankakee, Ill.
Riley Stoker Corp., 9 Neponset St., Worcester, Mass.
Robbins & Myers, Inc., Lagonda Ave., Springfield, O.
Roberts-Gordon Appliance Corp., 137 Arthur St., Buffalo 7, N. Y.
Roberts Tube Works, 2500 Military Ave., Detroit 9, Mich.
Robertson Co., H. H., 2400 Farmers Bank Bldg., Pittsburgh 22, Pa.
Robinson Insulation Co., Great Falls, Mont.
Rochester Lead Works, Inc., 380 Exchange St., Rochester, N. Y.
Rochester Mfg. Co., Inc., 100 Rockwood St., Rochester 10, N. Y.
Rock Fleece Co., 115 Durango St., El Paso, Tex.
Rock Island Register Co., 2435 Fifth Ave., Rock Island, Ill
Rock River Machine Co., Inc., N. Main St., Janesville, Wis.
Rockwood Mfg. Co., 1801-2001 English Ave., Indianapolis 6, Ind
Rockwood Sprinkler Co., 38 Harlow St., Worcester, Mass.
Roessing Mfg. Co., 1616 Noble St., Sharpsburg Branch, Pittsburgh, Pa.
Roller Bearing Co. of America, Whitehead Rd., Trenton 3, N. J
Rolyan Metal Products, 2330 W. 58th St., Chicago 36, Ill
Rome-Turney Radiator Co., Canal St., Rome, N. Y.
Roots-Connersville Blower Corp., 16th St. & Columbia Ave Connersville, Ind.
Roper Corp., Geo. D., Blackhawk Park Ave., Rockford, Ill
Rosebraugh Co., W. W., 680 S. 17th St., Salem, Ore.
Rosedale Foundry & Machine Co., Columbus & Preble Aves N. S., Pittsburgh, Pa.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17 N. Y.
Ross Heater & Mfg. Co., Inc., 1407 West Ave., Buffalo 13, N. Y
Ross Sprinkler Co., 34 Roberts St., Pasadena, Calif.
Ross Valve Mfg. Co., Inc., 6 Oakwood Ave., Troy, N. Y
Rotary Mfg. Co., 5718 Long Beach Ave., Los Angeles, Calif.
Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth N. J.
Roy Pumps, Milton, 1371 E. Mermaid Ave., Philadelphia 18, Pa
Royal Air Conditioning Equipment Co., 1024 Westminster Ave Alhambra, Calif.
Royal Ventilator Co., 415 Locust St., Philadelphia 6, Pa.
Royersford Foundry & Machine Co., Inc., 102-132 Main St Royersford, Pa.
Ruberoid Co., 500 Fifth Ave., New York, N. Y.
Ruby Chemical Co., 74 McDowell St., Columbus 8, O.
Ruehfel Co., Inc., George, 101 Menahan St., Brooklyn, N. Y
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee 12, Wis
Ruggles-Klingemann Mfg. Co., 4 Foster Ct., Salem, Mass.
Ruppright, Siegfried, 299 S. Atlantic Blvd., Los Angeles 22 Calif.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y
Russell Co., F. C., 1836 Euclid Ave., Cleveland, O.
Russell Electric Co., 348 W. Huron St., Chicago 10, Ill.
Russell Mfg. Co., John M., Box 246, Naugatuck, Conn
● Rutland Fire Clay Co., Curtis Ave., Rutland, Va.
Ruud Mfg. Co., 2934 Smallman St., Pittsburgh, Pa.
Ryniker Steel Products Co., 122-124 N. 25th St., Billings, Mont

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia Pa.
St. Louis Tool Co., 6100 Prescott St., St. Louis 15, Mo.
St. Paul Corrugating Co., Wabasha and Water Sts., St. Paul Minn.
Sac Tool Mfg. Co., 1913 Washington Ave., St. Louis 3, Mo.
Sales & Co., Murray W., 801 W. Baltimore Ave., Detroit 2, Mich
Salina Metal Products Co., 9th and Bishop, Salina, Kans.
Sall Mountain Co., 176 W. Adams St., Chicago 3, Ill.
Sampsel Time Control, Inc., Spring Valley, Ill.
Samson-United Corp., 1700 University Ave., Rochester, N. Y.
Sandberg Sheet Metal Works, 500 N. E. Union Ave., Portland Ore.
Sandee Mfg. Co., 3945 N. Western Ave., Chicago 18, Ill.
Sangamo Electric Co., 1301 N. 11th St., Springfield, Ill.
Sanvin Chemical Products Co., 1617 21st Ave., Moline, Ill.
Sarcotherm Controls, Inc., 222 W. North Bank Drive, Chicago 54, Ill.
● Sarco Co., Inc., 475 Fifth Ave., New York 17, N. Y.
Sauereisen Cements Co., Sharpsburg Station, Pittsburgh 15, Pa
Saunders Machine & Tool Corp., 25 Atherton St., Yonkers, N. Y.
Saverite Engineering Co., 1031 Clinton St., Hoboken, N. J.
Sawyer Electrical Mfg. Co., 5701 Smithway, Los Angeles, Calif
Scaife Co., 26 Ann St., Oakmont, Pa.
Scanlan-Morris Co., Madison 4, Wis.
Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa
● Schaible Co., The, Cincinnati 4, O.
Schatz Mfg. Co., Fairview, Poughkeepsie, N. Y.
Schaub Engineering Co., Fred H., 325 W. Huron St., Chicago 10, Ill.
Schecter Brothers Co., Hancock and Huntingdon Sts., Philadelphia 33, Pa.
Schieren Co., Chas. A., 30-38 Ferry St., New York, N. Y.
Schmieg Industries, 312-320 Piquette Ave., Detroit, Mich.
Schneible Co., Claude B., 2827 25th St., Detroit 16, Mich.
Schoedinger, F. O., 322-358 Mt. Vernon Ave., Columbus 16, O.
Schramm, Inc., West Chester, Pa.
Schubert-Christy Corp., Box No. 725, Indio, Calif.
Schundler & Co., Inc., F. E., 45-15 Vernon Blvd., Long Island City, N. Y.
Schutte & Koerting Co., 12th and Thompson Sts., Philadelphia, Pa.
Schwitzer-Cummins Co., 1125 Massachusetts Ave., Indianapolis 7, Ind.
Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill.

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Scientiae Tool Co., 400 Linden Ave., Dayton 3, O.
Scientific Instrument Co., 531-535 W. Larned, Detroit 26, Mich.
Scott-Newcomb, Inc., 1922 Pine St., St. Louis, Mo.
Scott Valve Mfg. Co., 3963 McKinley Ave., Detroit 8, Mich.
Sealed Power Corp., Muskegon 61, Mich.
Sealkote Corp., 400 N. Sangamon St., Chicago, Ill.
Seamlex Co., Inc., 27-27 Jackson Ave., Long Island City, N. Y.
Selas Corp. of America, Erie Ave. and D St., Philadelphia 34, Pa.
Sellers Engineering Co., 4860 N. Clark St., Chicago 40, Ill.
Semco Mfg. Co., 118-122 Third Ave., N., Nashville, Tenn.
Semet-Solvay Engineering Corp., 40 Rector St., New York 6, N. Y.
Semler Co., Jeannette, Pa.
Semon Bache & Co., Greenwich & Morton Sts., New York 14, N. Y.
Servel, Inc., Electric Refrigeration & Air Conditioning Div., 119 Morton Ave., Evansville 20, Ind.
Service To Industry, Box 133, West Hartford, Conn.
Service Machine Co., 158 Miller St., Elizabeth 4, N. J.
Shafer Bearing Corp., 1412 W. Washington, Chicago, Ill.
Shallcross Co., 48th and Grays Ferry Rd., Philadelphia, Pa.
Shallcross Controls, Inc., 121 N. Broadway, Milwaukee, Wis.
Shank Co., Cyrus, 625 W. Jackson Blvd., Chicago 6, Ill.
Sharon Steel Corp., Sharon, Pa.
Shaw Co., Benjamin F., Second & Lombard Sts., Wilmington 99, Del.
Shaw-Kendall Engineering Co., 120-130 S. Superior St., Toledo 4, O.
Shaw-Perkins Mfg. Co., Oliver Bldg., Pittsburgh, Pa.
Sheetlock Co., 4521 N. Clark St., Chicago 40, Ill.
Sheet Metal Mfg. Co., Inc., 953 Myrtle Ave., Brooklyn, N. Y.
Sheffler-Gross Co., Drexel Bldg., Philadelphia, Pa.
Sherwin-Williams Co., The, 101 Prospect Ave., N.W., Cleveland, O.
Shreveport Engineering Co., Inc., 1553-55 Texas Ave., Shreveport, La.
Sight Feed Generator Co., 14-18 N. 10th St., Richmond, Ind.
Signal Electric Mfg. Co., Menominee, Mich.
Signal Indicator Co., 140 Cedar St., New York, N. Y.
Silvercote Products, Inc., 161 E. Erie St., Chicago 11, Ill.
Simplex Heating Specialty Co., Inc., 1105 Church St., Lynchburg, Va.
Simplex Mfg. Co., 198 N. Main St., Fond du Lac, Wis.
Simplex Oil Heating Corp., 85 Main St., West Orange, N. J.
Sims Co., 18th & Whitley Sts., Erie, Pa.
Sinker-Davis Co., 230 S. Missouri St., Indianapolis 4, Ind.
Sioux Steel Co., Sioux Falls, S. D.
Sipe & Co., James B., Box 8010 S. Hills Branch, Pittsburgh, Pa.
Skidmore Corp., St. Joseph, Mich.
Skilbeck Mfg. Co., 7432 27th Ave., Kenosha, Wis.
Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill.
Skinner Co., M. B., South Bend, Ind.
Skinner Engine Co., 337 W. 12th St., Erie, Pa.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., 1954 N. 9th St., St. Louis 6, Mo.
Skinner Irrigation Co., 1212 E. Canal St., Troy, O.
Skuttle Mfg. Co., 517 E. Larned St., Detroit 26, Mich.
Slater Mfg. Co., 24 Water St., Wakefield, Mass.
Sly Mfg. Co., W. W., 4700 Train Ave., Cleveland 2, O.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
● Smith Co., Inc., H. B., The, 57 Main, Westfield, Mass.
Smith, Inc., James Campbell, 1679 Collamer Rd., Cleveland, O.
Smith, Inc., Winfield, H., 144 Eaton St., Springville, Erie County, N. Y.
Smith & Kanzler Corp., 516-534 Lidgerwood Ave., Elizabeth 2, N. J.
Smith Mfg. Co., Inc., F. A., P.O. Box 509, Rochester 2, N. Y.
Smith-Raymond Co., 1231-33 Tenth Ave., Columbus, Ga.
Smith Twin Tubular Boiler Co., Inc., Cottman St., at State Rd., Philadelphia, Pa.
Smith Welding Equipment Corp., 2633 S.E. Fourth St., Minneapolis 14, Minn.
Smolensky Valve Co., Inc., 940 Broadway, Bedford, O.
Smooth-On Mfg. Co., 568-574 Communipaw Ave., Jersey City 4, N. J.
Snap-On Tools Corp., Kenosha, Wis.
Socony Paint Products, Div. of Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y.
Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.
Solar Aircraft Co., San Diego, Calif.
Solvay Sales Corp., 42 Rector St., New York, N. Y.
Somers, Inc., H. J., 6063 Wabash Ave., Detroit, Mich.
Somerville Iron Wks., Somerville, N. J.
Sonneborn Sons, Inc., L., 88 Lexington Ave., New York 16, N. Y.
Sonner Burner Co., 412-420 E. 6th Ave., Winfield, Kans.
South Bend Air Products Corp., 304 E. Colfax Ave., South Bend, Ind.
South Chester Tube Co., Front & Thurlow Sts., P.O. Box 60, Chester, Pa.
Southbridge Roofing Co., Inc., Hartwell and Chapin Sts., Southbridge, Mass.
Souther Iron Co., E. E., 1952 Kienlen Ave., St. Louis 20, Mo.
Southern States Iron Roofing Co., Stiles Ave., Savannah, Ga.
Southport Paint Co., Div. Wesson Oil & Snowdrift Co., Inc., Savannah, Ga.
● Spang-Chalfant, Div. of National Supply Co., Grant Bldg., Pittsburgh 30, Pa.
Specialty Converters, Inc., East Braintree, Mass.
Speedway Mfg. Co., 1834 S. 52nd Ave., Chicago (Cicero), Ill.
Spence Engineering Co., Inc., 32 Grant St., Walden, N. Y.
Spencer Heater Div., The Aviation Corp., 164 Park St., Williamsport, Pa.
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.
Spencer Turbine Co., 486 New Park Ave., Hartford 6, Conn.
Sporlan Valve Co., 3723 Commonwealth St., St. Louis 17, Mo.
Spray Engineering Co., 112 Central St., Somerville 45, Mass.
● Spraying Systems Co., 4031 W. Lake St., Chicago 24, Ill.
Sprayo-Flake Co., 2715 Irving Park Blvd., Chicago 18, Ill.
Sprout-Waldron & Co., Muncy, Pa.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Square D Co., Industrial Controller Div., 4041 N. Richards St., Milwaukee 12, Wis.
Squires Co., C. E., The, E. 40th St. & Kelley Ave., Cleveland 3, O.
Stainless & Steel Products Co., 1000 Berry Ave., St. Paul, Minn.
Standard Asbestos Mfg. Co., 820-822 W. Lake St., Chicago 7, Ill.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., 2461 E. Grand Blvd., Detroit, Mich.
Standard Engineering Wks., 289 Roosevelt Ave., Pawtucket, R. I.
Standard Fuel Engineering Co., 667 Post Ave., S., Detroit, Mich.
Standard Furnace & Supply Co., 413-17 S. Tenth St., Omaha, Neb.
Standard Galvanizing Co., 2619 W. Van Buren St., Chicago, Ill.
Standard Heater & Oil Equipment Co., 245 Cornelison Ave., Jersey City 2, N. J.
Standard Lime & Stone Co., 2004 First National Bank Bldg., Baltimore, Md.
Standard Pressed Steel Co., Jenkintown, Pa.
Standard Reseater Corp., 423 W. 126th St., New York 27, N. Y.
Standard Rolling Mills, Inc., 143 Jewel St., Brooklyn 22, N. Y.
Standard Stamping & Perforating Co., 3131 W. 49th Pl., Chicago 32, Ill.
Standard Thermometer, Inc., 65 Shirley St., Boston, Mass.
Standard Transmission Equipment Co., 3407 Verdugo Rd., Los Angeles 41, Calif.
Standard Tube Co., 14600 Woodward Ave., Highland Park 3, Mich.
Standard Ventilator Co., Lewisburg, Pa.
Stanley Electric Tools, Div. of The Stanley Works, Elm St., New Britain, Conn.
Staples & Pfeiffer, 528 Bryant St., San Francisco 7, Calif.
● Star Electric Motor Co., 197 Grove St., Bloomfield, N. J.
Star Expansion Bolt Co., 147 Cedar St., New York 6, N. Y.
Star Mfg. Co., Inc., 530 Kinsley Ave., Providence, R. I.
Star Products Co., 130 Walnut Ave., New York 54, N. Y.
Starr Piano Co., Richmond, Ind.
Steamaire Co., Cincinnati 2, O.
Steel City Electric Co., 1201 Columbus Ave., Pittsburgh, Pa.
Steel Improvement & Forge Co., 974 E. 64th St., Cleveland 14, O.
Steel Products Engineering Co., The, 1205 W. Columbia St., Springfield, O.
Steel and Tubes Div., Republic Steel Corp., 224 E. 131st St., Cleveland 8, O.
Steinhorst & Sons, Inc., Emil, 612 South St., Utica, N. Y.
● Stephens-Adamson Mfg. Co., 55 Ridgeway Ave., Aurora, Ill.
Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif.
Sterling Engineering & Mfg. Corp., 114 Business St., Hyde Park 36, Mass.
● Sterling, Inc., 3738 N. Holton St., Milwaukee 11, Wis.
Stewart Ice Machine Co., 1046 E. 22nd St., Los Angeles, Calif.
Stewart Mfg. Co., 610 Bloomfield Ave., Bloomfield, N. J.
Stewart-Rogers, Inc., 3915 Powelton Ave., Philadelphia 4, Pa.
Stewart-Warner Corp., 1826-1852 Diversey Parkway, Chicago 14, Ill.
Stickle Steam Specialties Co., 2215 Valley Ave., Indianapolis, Ind.
Stockham Pipe Fittings Co., 4100 Tenth Ave., N., Birmingham 2, Ala.
Stok-A-Fire Co., 6504 Olive Street Road, University City 5, Mo.
Stokermatic Div., Rheem Mfg. Co., 1415 S. State St., Salt Lake City 4, Utah.
Stokes Machine Co., F. J., 5910 Tabor Rd., Philadelphia, Pa.
Stokes Rubber Co., Jos., Taylor & Webster, Trenton, N. J.
Stout & Sons, David, 3943 Cleveland Ave., St. Louis 10, Mo.
Stow Mfg. Co., 445 State St., Binghamton, N. Y.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, 218 S. Geddes St., Syracuse, N. Y.
Strandwitz & Co., Inc., W. J., Jefferson and Master Sts., Camden, N. J.
Strong, Carlisle & Hammond Company, 1392 W. Third St., Cleveland, O.
Struthers Dunn, Inc., 1321 Arch St., Philadelphia, Pa.
Struthers Wells Corp., Titusville, Pa.
Stuart Co., W. W., 417 Ninth St., Des Moines, Iowa.
● Sturtevant Co., B. F., Damon St., Hyde Park, Boston 36, Mass.
Sturtevant Co., P. A., Addison, Ill.
Sudbury Laboratory, South Sudbury, Mass.
Sullivan Machinery Co., Michigan City, Ind.
● Sullivan Valve & Engineering Co., 910 S. Arizona St., Butte, Mont.
Sundstrand Machine Tool Co., Pump Div., 2531 11th St., Rockford, Ill.
Sun-Fire Stoker Corp., New Albany, Ind.
Super Mold Corp., 402 N. Sacramento St., Lodi, Calif.
Super Radiator Corp., 652 Stinson Blvd., Minneapolis 13, Minn.
Superior Railway Products Corp., 7501 Thomas Blvd., Pittsburgh, Pa.
Superior Sheet Steel Co., The, Division of Continental Steel Corp., Canton-Louisville Rd., Canton, O.
Superior Steel Corp., Grant Bldg., Pittsburgh, Pa.
Superior Valve and Fittings Co., 1509 W. Liberty Ave., Pittsburgh 26, Pa.

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Superstat Co., 38 Walter St., Springfield, Mass.
Supreme Air Filter Co., 126 W. 21st St., New York, N. Y.
Supreme Electric Products Corp., 194 Vassar St., Rochester 7, N. Y.
● Surface Combustion, 2375 Dorr St., Toledo 1, O.
Swaby Mfg. Co., 2330 W. Cermak Rd., Chicago 8, Ill.
Swaine Mfg. Co., Fred J., 1300 N. Seventh St., St. Louis, Mo.
● Swartwout Co., 18511 Euclid Ave., Cleveland 12, O.
Swift Mfg. Co., 247 McDougall Ave., Detroit 7, Mich.
Synchro-Start Products, 221 E. Cullerton St., Chicago 16, Ill.
Syntron Co., Homer City, Pa.

Taber Pump Co., 272 Elm St., Buffalo 3, N. Y.
Taco Heaters, Inc., 342 Madison Ave., New York, N. Y.
Tagliabue Mfg. Co., C. J., 550 Park Ave., Brooklyn 5, N. Y.
Tallmadge & Co., Webster, 364 Glenwood Ave., East Orange, N. J.
Tal's Prestal Bender, Inc., 225 N. Water St., Milwaukee, Wis.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.
● Taylor Forge & Pipe Wks., P. O. Box 485, Chicago 90, Ill.
Taylor-Hall Welding Corp., 99 Hope Ave., Worcester 3, Mass.
● Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y.
Taylor Sons Co., Charles, 715 Burns St., Cincinnati 14, O.
Taylor-Winfield Corp., 1052 Mahoning Ave., N. W., Warren, O.
Technical Ply-Woods, 228 N. LaSalle St., Chicago 1, Ill.
Techtmann Industries, Inc., 828 N. Broadway, Milwaukee, Wis.
Tecumseh Products Co., Tecumseh, Mich.
Telsit Insulation Co., 1933 West Farms Rd., Bronx, N. Y.
Templeton Bros., Inc., 699 Main St., Walpole, Mass.
Templeton Mfg. Co., 114 Business St., Hyde Park 36, Mass.
Temprite Products Corp., 47 Piquette Ave., Detroit 2, Mich.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham 2, Ala.
Tennessee Products Corp., American National Bank Bldg., Nashville, Tenn.
Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.
Terry Steam Turbine Co., The, P. O. Box 1200, Hartford 1, Conn.
Textite Corp., 2110 Roscoe St., Chicago 18, Ill.
Thatcher Furnace Co., Centre St., Garwood, N. J.
Thermal Co., Inc., 1434 N. Fourth St., Milwaukee, Wis.
Thermal Engineering Co., 2967 S. LaSalle St., Chicago 16, Ill.
Thermal Industries, Box No. 725, Indio, Calif.
Thermal Syndicate, Ltd., The, 12 E. 46th St., New York, N. Y.
Therminsul Corp., 1603 Fulford St., Kalamazoo, Mich.
Thermix Engineering Co., Greenwich, Conn.
Thermoid Rubber, Div. of Thermoid Co., Whitehead Rd., Trenton 6, N. J.
Thermo-Mix, Inc., 4009 21st St., Long Island City, N. Y.
Thomas Co., Arthur H., W. Washington Square, Philadelphia, Pa.
Thompson & Co., Box 6757, Pittsburgh, Pa.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
● Thrush & Co., H. A., Peru, Ind.
Thwing-Albert Instrument Co., Penn and Pulaski Sts., Philadelphia, Pa.
Tierney Rotor Ventilator Co., 239 Fourth Ave., S., Minneapolis, Minn.
Tiffin Eaves Trough Clamp Co., 25 Miami, Tiffin, O.
Timken Roller Bearing Co., 1835 Dueber Ave., S. W., Canton 6, O.
Timken Roller Bearing Co., Steel and Tube Div., Canton 6, O.
● Tinnerman Products, Inc., 2018 Fulton Rd., Cleveland 13, O.
Tippett & Wood, Morris and Warren Sts., Phillipsburg, N. J.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.
Titusville Iron Wks. Co., S. Franklin St., Titusville, Pa.
● Todd Shipyards Corp., Combustion Equipment Div., 601 W. 26th St., New York 1, N. Y.
Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo 4, O.
Torchweld Equipment Div., National Cylinder Gas Co., 4700 W. 19th St., Chicago 50, Ill.
Torit Mfg. Co., 292 Walnut St., St. Paul 2, Minn.
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.
Torrington Mfg. Co., 70 Franklin St., Torrington, Conn.
Trade-Wind Motorfans, Inc., 5725 S. Main St., Los Angeles, Calif.
Trageser Copper Wks., Inc., 5000 Grand Ave., Maspeth, Long Island, N. Y.
● Trane Co., The, La Crosse, Wis.
Trent Co., Harold E., Leverington Ave. and Wilde St., Philadelphia, 27, Pa.
Trent Tube Mfg. Co., East Troy, Wis.
Trerice Co., H. O., 1420 W. Lafayette Blvd., Detroit 16, Mich.
Triangle Mfg. Co., 396 Division St., Oshkosh, Wis.
Trimont Mfg. Co., 55-71 Amory St., Roxbury, Boston 19, Mass.
Trimount Instrument Co., 37 W. Van Buren St., Chicago 5, Ill.
Trimount Rotary Power Co., 398 Whiting Ave., East Dedham, Mass.
Trindl Products, Ltd., 2227-AD Calumet Ave., Chicago, Ill.
Triplex Heating Specialty Co., 252 N. Grant, Peru, Ind.
Triumph Ice Machine Co., 110-116 E. 70th St., Cincinnati, O.
Tropical Paint & Oil Co., 1244-86 W. 70th St., Cleveland, O.
Troy Engine & Machine Co., Troy, Pa.
Truflo Fan Co., 523 Main St., Harmony, Pa.
Tru-Line Corp., 759 Venice Blvd., Los Angeles 15, Calif.
Trumbull Electric Mfg. Co., Woodford Ave., Plainville, Conn.
Truscon Laboratories, Caniff and Grand Trunk R. R., Detroit 11, Mich.
Truscon Steel Co., 1315 Albert St., Youngstown 1, O.
Tryco Products, Inc., Railroad Sq., Westfield, Mass.
● Tube Turns, 238 E. Broadway, Louisville 1, Ky.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.
Turner Brass Wks., The, 821-47 Park Ave., Sycamore, Ill.
Tutnill Pump Co., 939 E. 95th St., Chicago 19, Ill.
● Tuttle & Bailey, Inc., Corbin Ave., New Britain, Conn.
XXth Century Heating & Ventilating Co., 96 Ira Ave., Akron, O.

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.
U. S. Electrical Tool Co., 1050 Findlay St., Cincinnati 14, O.
U. S. Expansion Bolt Co., P. O. Box 827, State St. & P. R. R., York, Pa.
U. S. Gutta Percha Paint Co., 14 Dudley St., Providence, R. I.
U. S. Machine Corp., Lebanon, Ind.
U. S. Motors Corp., Oshkosh, Wis.
Uehling Instrument Co., 473 Getty Ave., Paterson 3, N. J.
Una Welding, Inc., 1615 Collamer Ave., E., Cleveland 10, O.
Underground Steam Construction Co., 73 Pitts St., Boston, Mass.
Unified Air Conditioner Co., Torry Bldg., Duluth, Minn.
Uniflow Mfg. Co., E. Lake Rd., Erie, Pa.
● Union Asbestos & Rubber Co., 54th Ave. and 18th St., Cicero 50, Ill.
Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Union Iron Wks., 1500 Cascade St., Erie, Pa.
Union Metal Wks., 128 Carter St., Chelsea 50, Mass.
Union Steam Pump Co., Capitol Ave., S. W., Battle Creek, Mich.
Union Water Meter Co., 333 Hermon St., Worcester, Mass.
United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y.
United Cork Companies, Central Ave., Kearny, N. J.
United Electric Controls Co., 69-71 A St., Boston 27, Mass.
United Metal Hose Co., Inc., 36-01 43rd Ave., Long Island City 1, N. Y.
● United States Air Conditioning Corp., 2101 Kennedy St., N. E., Minneapolis 13, Minn.
United States Brass & Copper Co., Hyde Park, Boston, Mass.
United States Gasket Co., 1518 Pierce Ave., Camden, N. J.
United States Gauge Co., Sellersville, Pa.
United States Gypsum Co., 300 W. Adams St., Chicago 6, Ill.
United States Mineral Wool Co., 9 S. Clinton St., Chicago, Ill.
United States Ozone Co. of America, Crescent St., Scottdale, Pa.
United States Pipe & Foundry Co., Burlington, N. J.
United States Radiator Corp., 1500 United Artists Bldg., Detroit 31, Mich.
United States Register Co., Burnham St., Battle Creek, Mich.
United States Rubber Co., 1230 Sixth Ave., New York, N. Y.
United States Steel Corp., 436 Seventh Ave., Pittsburgh, Pa.
United States Steel Supply Co., 1319 W. Wabansia, Chicago, Ill.
United States Stoneware Co., 60 E. 42nd St., New York 17, N. Y.
United Superior Union Co., Inc., 29 Ryerson St., Brooklyn, N. Y.
Universal Air Filter Corp., 332 W. Michigan St., Duluth 2, Minn.
Universal Cooler Corp., Marion, O.
Universal-Cyclops Steel Corp., Bridgeville, Pa.
Universal Gypsum & Lime Co., 111 W. Washington St., Chicago, Ill.
Universal Motor Co., 323 Universal Ave., Oshkosh, Wis.
Universal Power Corp., 4930 Euclid Ave., Cleveland 3, O.
Universal Zonolite Insulation Co., 135 S. LaSalle St., Chicago 3, Ill.
Uno Ventilator Co., 565 Lincoln Ave., Cliftondale, Mass.
USHCO Mfg. Co., Inc., 135 Tonawanda St., Buffalo 7, N. Y.
Utica Products, Inc., Utica 4, N. Y.
Utica Radiator Corp., 2201 Dwyer Ave., Utica, N. Y.
Utility Appliance Corp., 4851 S. Alameda St., Los Angeles 11, Calif.
Utility Laboratory, Inc., 330 36th St., Brooklyn, N. Y.

Vanderman Mfg. Co., Mansfield Ave., Willimantic, Conn.
Van Dorn Electric Tool Co., Towson, Md.
Van Noorden Co., E., 100 Magazine St., Boston 19, Mass.
Vapor Car Heating Co., Inc., 80 E. Jackson Blvd., Chicago, Ill.
Vapor Specialty Co., 101 W. 42nd St., New York 18, N. Y.
Ventilating Products Co., 2800 Cottage Grove Ave., Chicago, Ill.
Verson Allsteel Press Co., 93rd & Kenwood Ave., Chicago 19, Ill.
Vesco Corp., 1381 Sedgwick Ave., New York 52, N. Y.
● Vibration Eliminator Co., 8-22 Astoria Blvd., Long Island City 2, N. Y.
Vibration Control Co., 545 Fifth Ave., New York, N. Y.
Victaulic Co. of America, 30 Rockefeller Plaza, New York 20, N. Y.
Victor Electric Products, Inc., 2950 Robertson Rd., Cincinnati, O.
Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif.
Viking Air Conditioning Corp., 5600 Walworth Ave., Cleveland, O.
Viking Mfg. Corp., U. B. Bldg., 16th Floor, Dayton 2, O.
Viking Pump Co., Fourth and State Sts., Cedar Falls, Ia.
Viking Shear Co., 1063 W. 19th St., Erie, Pa.
Vilter Mfg. Co., 2148 S. First St., Milwaukee 7, Wis.
Vinco Co., Inc., The, 305 E. 45th St., New York 17, N. Y.
Virginia Rubatex Div., Great American Industries, Inc., Bedford, Va.
Virginia Smelting Co., West Norfolk, Va.
Vita-Screen Ventilator Co., 103 Park Ave., New York, N. Y.
Vogt Machine Co., Henry, 1000 W. Ormsby St., Louisville 1 Ky.
Vortex Mfg. Co., 687 N. Tillamook St., Portland, Ore.
Voss Co., J. H. H., 785 E. 144th St., Corner of Wales Ave., New York 54, N. Y.
Vulcan Electric Co., 88-90 Holten St., Danvers, Mass.
● Vulcan Radiator Co., 26 Francis Ave., Hartford 6, Conn.

Wade Mfg. Co., Elgin, Ill.
● Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.
Walles Dove-Hermiston Corp., Westfield, N. J.
Waldron Corp., John, New Brunswick, N. J.
Walker Jamar Co., 367 S. First Ave., E., Duluth, Minn.

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Wall Chemicals Div. of The Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago 23, Ill.
Wallace Supplies Mfg. Co., 1304 Diversey Pkwy., Chicago 14, Ill.
Wallace & Tiernan Co., Inc., P. O. Box 178, Newark 1, N. J.
Walsh-Holyoke Steam Boiler Co., Holyoke, Mass.
Walsh Refractories Corp., 4070 N. First St., St. Louis 7, Mo.
● Walworth Co., 60 E. 42nd St., New York 17, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
● Ward Leonard Electric Co., 37 South St., Mt. Vernon, N. Y.
Warlo Corp., 330 W. 42nd St., New York, N. Y.
Warren Electric Appliance Co., Warren Bank & Trust Co. Bldg., Warren, Pa.
Warren Foundry & Pipe Corp., 11 Broadway, New York 4, N. Y.
Warren Steam Pump Co., Inc., 300 Bridges Ave., Warren, Mass.
● Warren Webster & Co., 17th and Federal Sts., Camden, N. J.
Washburne & Co., E. G., 207 Fulton St., New York, N. Y.
Water Cooling Corp., 71 Nassau St., New York, N. Y.
Water Cooling Equipment Corp., New Hampshire Ave. & Weber Rd., Affton Station, St. Louis 23, Mo.
Water Cooling Tower Co., 5501 Cornell Ave., Chicago, Ill.
Water Refining Co., 1123 Barthold, Ft. Wayne, Ind.
Water Service Laboratories, Inc., 423 W. 126th St., New York 27, N. Y.
Water Treatment Company of America, 1159 Hodgkiss St., Pittsburgh 12, Pa.
Waterfilm Boilers, Inc., 154 Ogden Ave., Jersey City, N. J.
Waterloo Register Co., 600 Anita St., Waterloo, Ia.
Watson & McDaniel Co., 440 N. Marshall, Philadelphia 23, Pa.
Watson-Stillman Co., 140 Aldene Rd., Roselle, N. J.
Wattenamel Co., 7400 Archer Ave., Summit, Ill.
Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Waukesha Motor Co., Waukesha, Wis.
Waverly Heating Supply Co., 31 Union St., Boston, Mass.
Way Loctor Access Panel Co., 120 Boylston St., Boston 16, Mass.
Wayne Davies & Co., 326 Pleasant St., Worcester 2, Mass.
Wayne Oil Burner Co., 800 Glasgow Ave., Fort Wayne 4, Ind.
Weatherhead Co., 300 E. 131st St., Cleveland 8, O.
Weaver Mfg. Co., Springfield, Ill.
● Webster & Co., Warren, 17th & Federal Sts., Camden, N. J.
Webster Electric Co., Racine, Wis.
● Webster Engineering Co., 419 W. Second St., Tulsa, Okla.
Webster Tallmadge & Co., 364 Glenwood Ave., East Orange, N. J.
Wedge Protectors, Inc., 9522 Richmond Ave., Cleveland 5, O.
Weil-McLain Co., 641 W. Lake St., Chicago 6, Ill.
Weil Pump Co., 1528 N. Fremont St., Chicago 22, Ill.
Weinman Pump Mfg. Co., 290 W. Spruce St., Columbus 8, O.
● Weirton Steel Co., Weirton, W. Va.
Weiss & Co., H., 113-115 Mercer St., New York, N. Y.
Weksler Thermometer Corp., 52-56 W. Houston St., New York 12, N. Y.
Weldex, Inc., 7326 McDonald Ave., Detroit, Mich.
Welding Apparatus Co., 2750 W. Van Buren St., Chicago, Ill.
Werner Co., Inc., R. D., 295 Fifth Ave., New York 16, N. Y.
Westco Pumps, Fairbanks, Morse & Co., 2850 Chippewa St., St. Louis 18, Mo.
Western Blower Co., 1800 Airport Way, Seattle 4, Wash.
● Western Brass Mill Div., Olin Industries, Inc., East Alton, Ill.
Western Chemical Co., 713 Washington St., Kansas City, Mo.
Western Engineering & Mfg. Co., 1726 E. Washington Blvd., Los Angeles 21, Calif.
Western Felt Wks., 4029-4117 Ogden Ave., Chicago 23, Ill.
Western Furnaces, Inc., 950 Commerce St., Tacoma 2, Wash.
Western Hanger Co., 55 New Montgomery St., San Francisco, Calif.
Western Mineral Products Co., 2602 Ed Creighton Ave., Omaha 1, Nebr.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Western Silicair Products, Inc., 72 W. Alameda Ave., Burbank, Calif.
● Western Thermal Equipment Co., 5141 Angeles Vista Blvd., Los Angeles 43, Calif.
Western Wire & Iron Works, Inc., 957 W. 18th Pl., Chicago 8, Ill.
Western Wire Products Co., 1415-35 S. 18th St., St. Louis, Mo.
Westfalia Separator Co., 30 Orange St., Bloomfield, N. J.
Westinghouse Electric & Mfg. Co., Bloomfield, N. J.
● Westinghouse Electric & Mfg. Co., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., 653 Page Blvd., Springfield, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
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Wheeling Steel Corp., Wheeling Steel Corp. Bldg., Wheeling, W. Va.
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Zenith Electric Co., 152 W. Walton St., Chicago 10, Ill.
● Zink Co., John, 4401 S. Peoria St., Tulsa, Okla.

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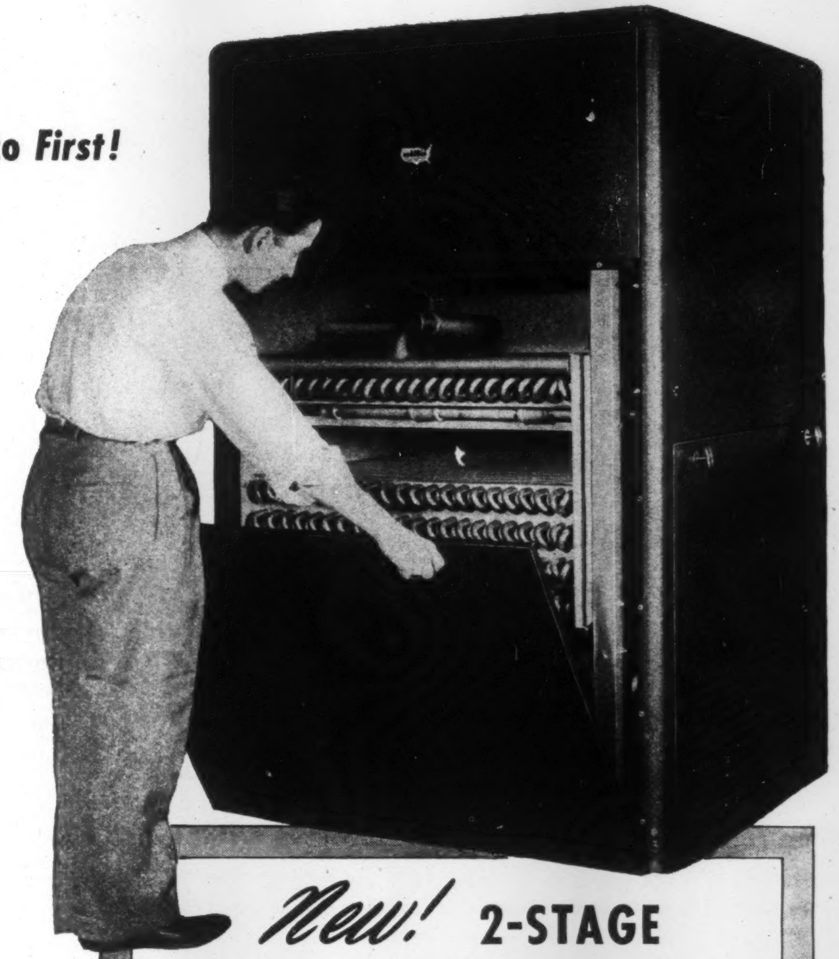
Another usAIRco First!



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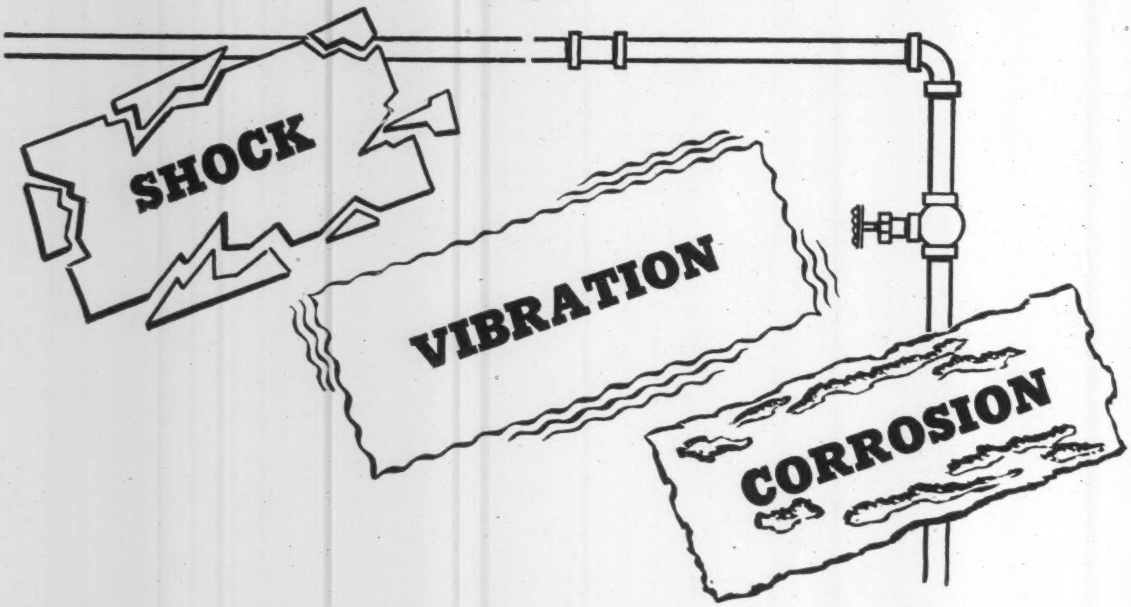
# End the Triple Menace TO COPPER TUBE AND BRASS PIPE LINES



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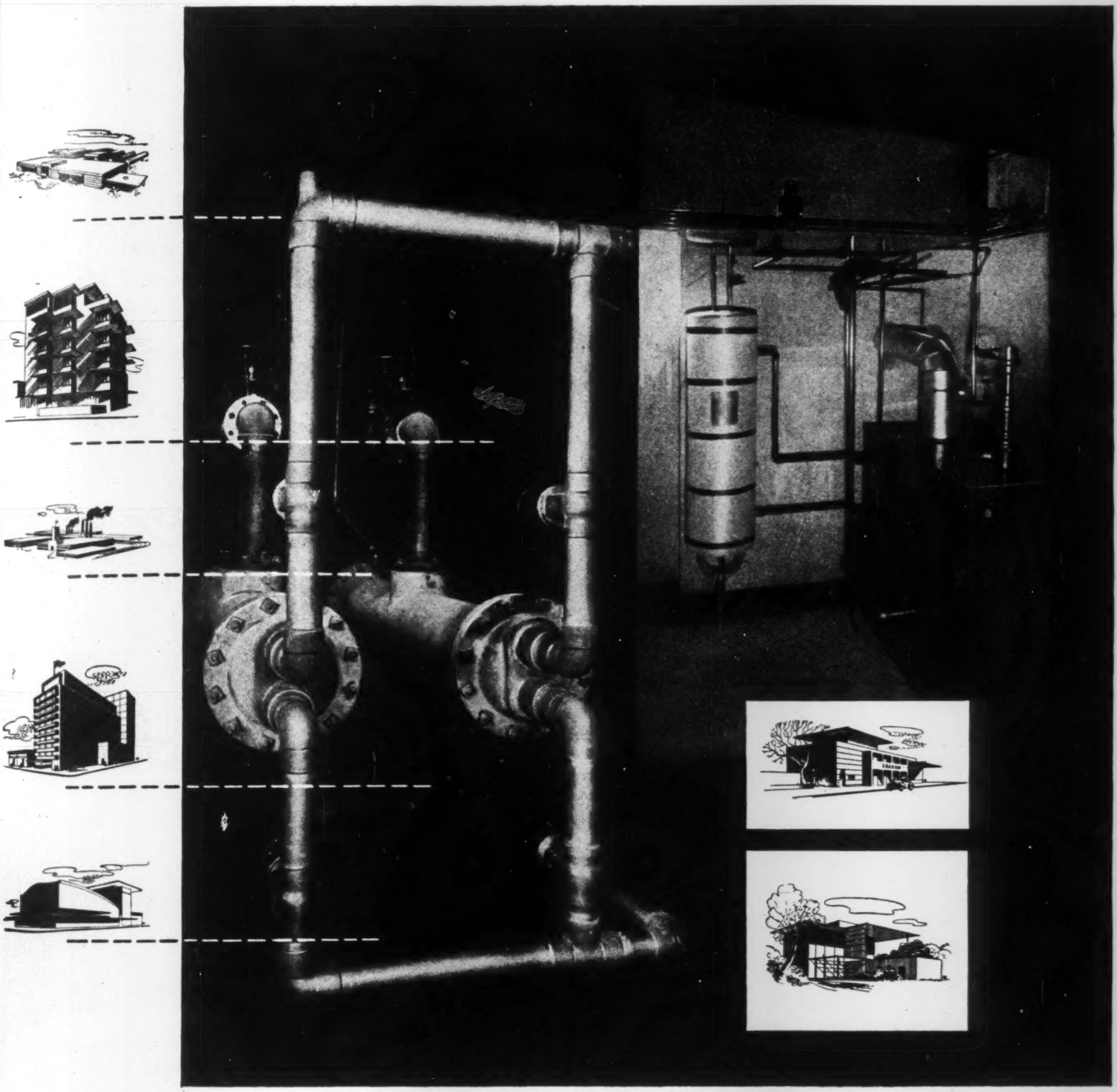

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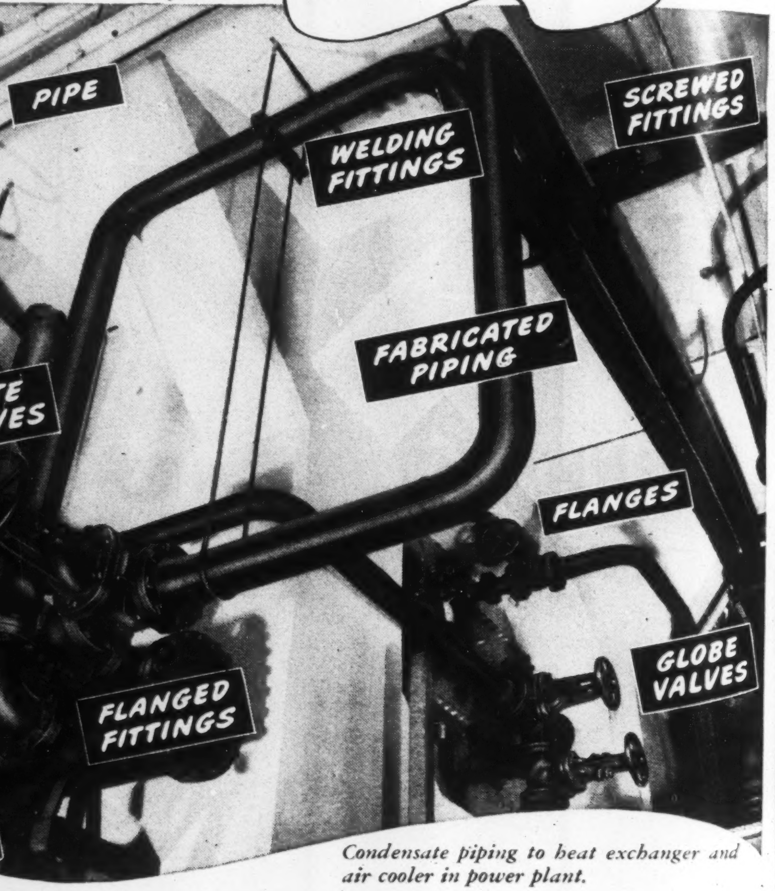
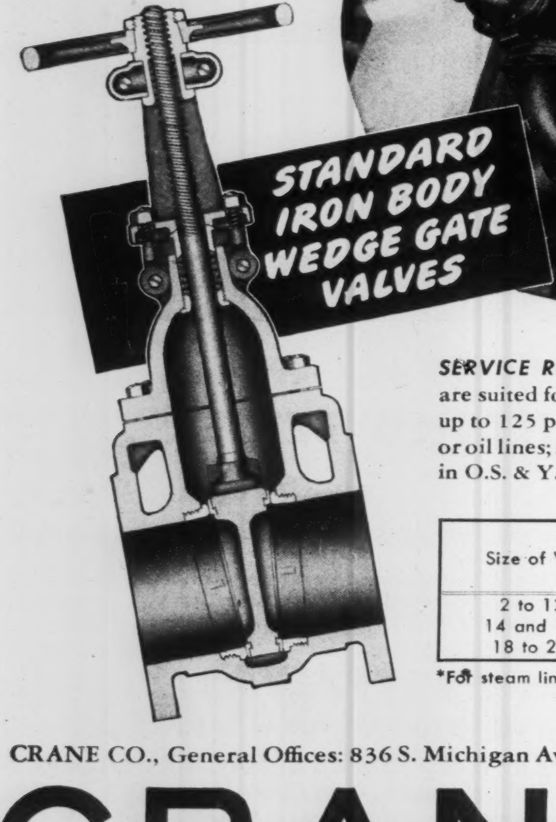


*Condensate piping to heat exchanger and air cooler in power plant.*



***SERVICE RECOMMENDATIONS:* Crane Standard Iron Body Wedge Gate Valves** are suited for many services in factories and power plants, at all working pressures up to 125 pounds steam. Brass trimmed valves are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O.S. & Y. and Non-Rising Stem patterns. See page 101 of your Crane Catalog.

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| Size of Valve | Screwed or Flanged End Valves | | Hub End Valves |
|---|---|---|---|
| | Saturated Steam | Cold Water, Oil or Gas, Non-Shock | Cold Water or Gas Non-Shock |
| 2 to 12 in. | 125 pounds | 200 pounds | 200 pounds |
| 14 and 16 in. | 125 pounds | 150 pounds | 150 pounds |
| 18 to 24 in. | * | 150 pounds | 150 pounds |

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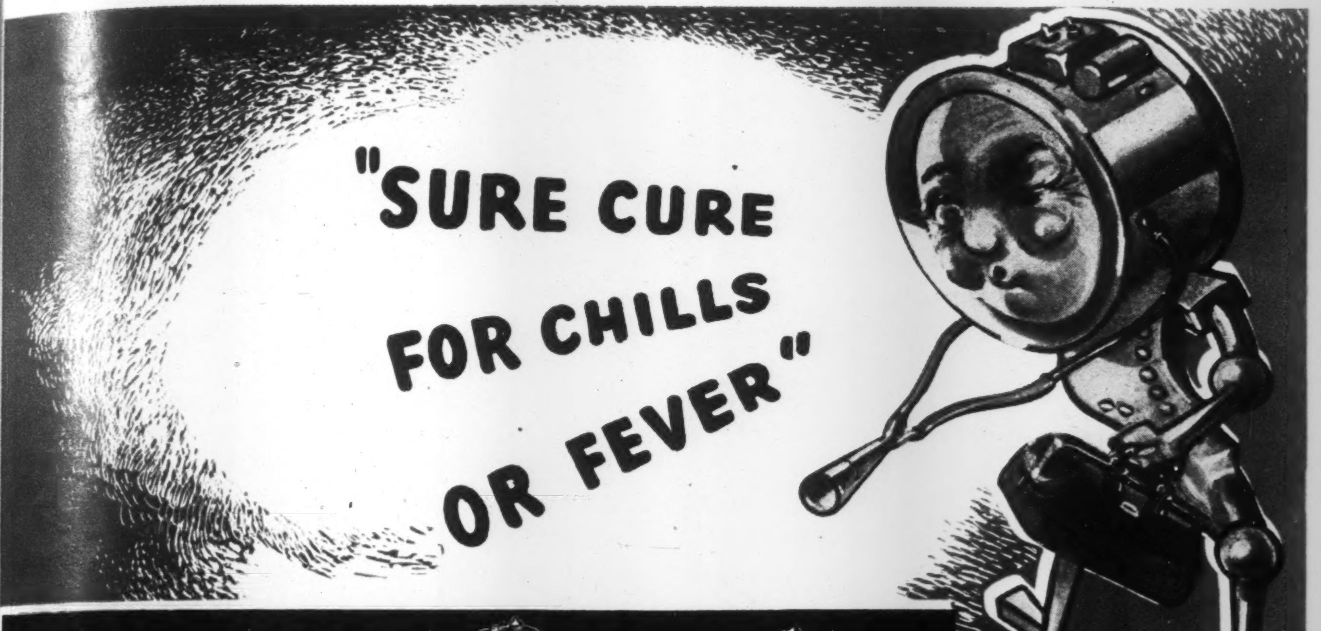
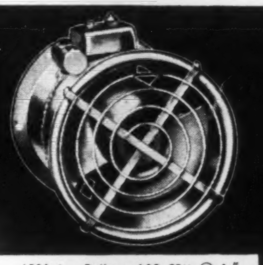
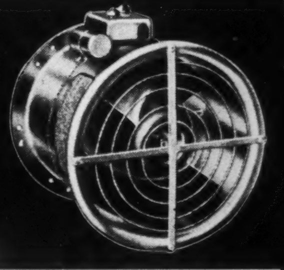


1921-C — Delivers 15 CFM @ .4" S.P., 12,500 RPM. Overall length 4"; diameter 2-3/4"; weighs 7 oz. (1/500 HP).

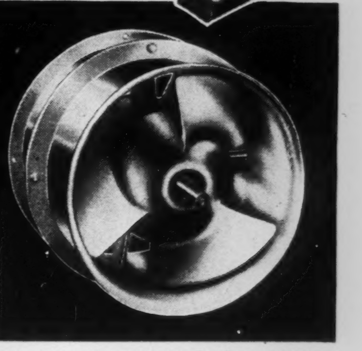
2881-A — Delivers 50 CFM @ .6" S.P., 9400 RPM. Overall length 4-1/8"; diameter 3-3/4"; weight 18 oz. (1/100 HP).



4581-A — Delivers 180 CFM @ 1." S.P., 7500 RPM. (1/12 HP). Overall length 6-7/16"; diameter 5-3/4"; weight 4 lbs. 2 oz.



5861-C — Delivers 400 CFM @ 1." S.P., 6300 RPM. (1/10 HP). Overall length 6-7/16"; diameter 7-1/16"; weight 5 lbs. 4 oz.



121 — Delivers from 1000 CFM @ .4" S.P. at 1750 RPM to 4300 CFM @ 7." S.P. at 7200 RPM for belt or direct drive, also available with built-in 3-phase motor. Overall length 10-1/2"; diameter 15".

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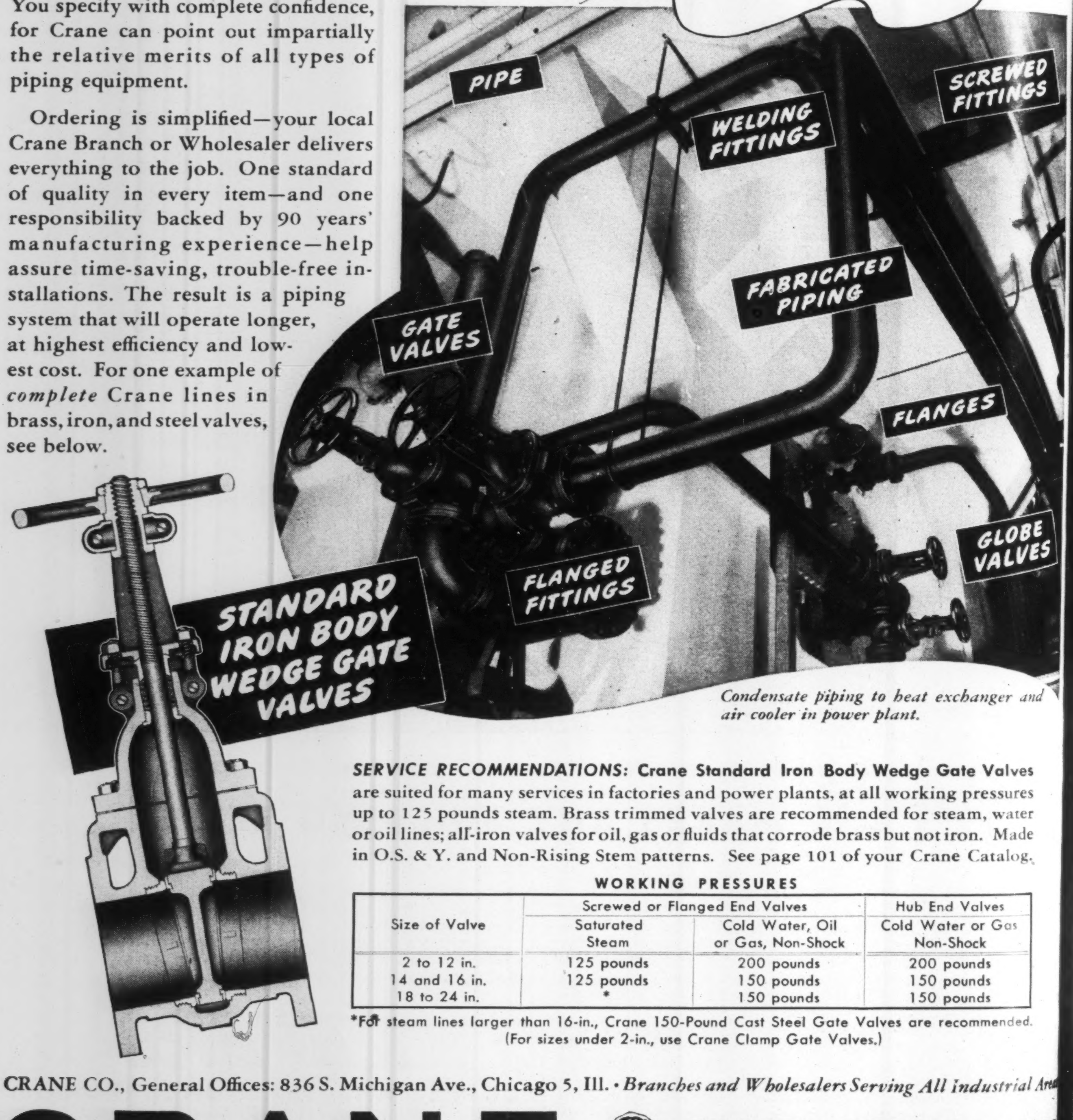
# CRANE Supplies Everything

● Whether piping reconversion jobs are big or small, Crane is your logical partner to help get them done quickly. You select *all* materials from the world's largest line of valves, fittings, pipe, accessories and fabricated piping. You specify with complete confidence, for Crane can point out impartially the relative merits of all types of piping equipment.

Ordering is simplified—your local Crane Branch or Wholesaler delivers everything to the job. One standard of quality in every item—and one responsibility backed by 90 years' manufacturing experience—help assure time-saving, trouble-free installations. The result is a piping system that will operate longer, at highest efficiency and lowest cost. For one example of *complete* Crane lines in brass, iron, and steel valves, see below.



*Condensate piping to heat exchanger and air cooler in power plant.*

***SERVICE RECOMMENDATIONS:*** **Crane Standard Iron Body Wedge Gate Valves** are suited for many services in factories and power plants, at all working pressures up to 125 pounds steam. Brass trimmed valves are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O.S. & Y. and Non-Rising Stem patterns. See page 101 of your Crane Catalog.

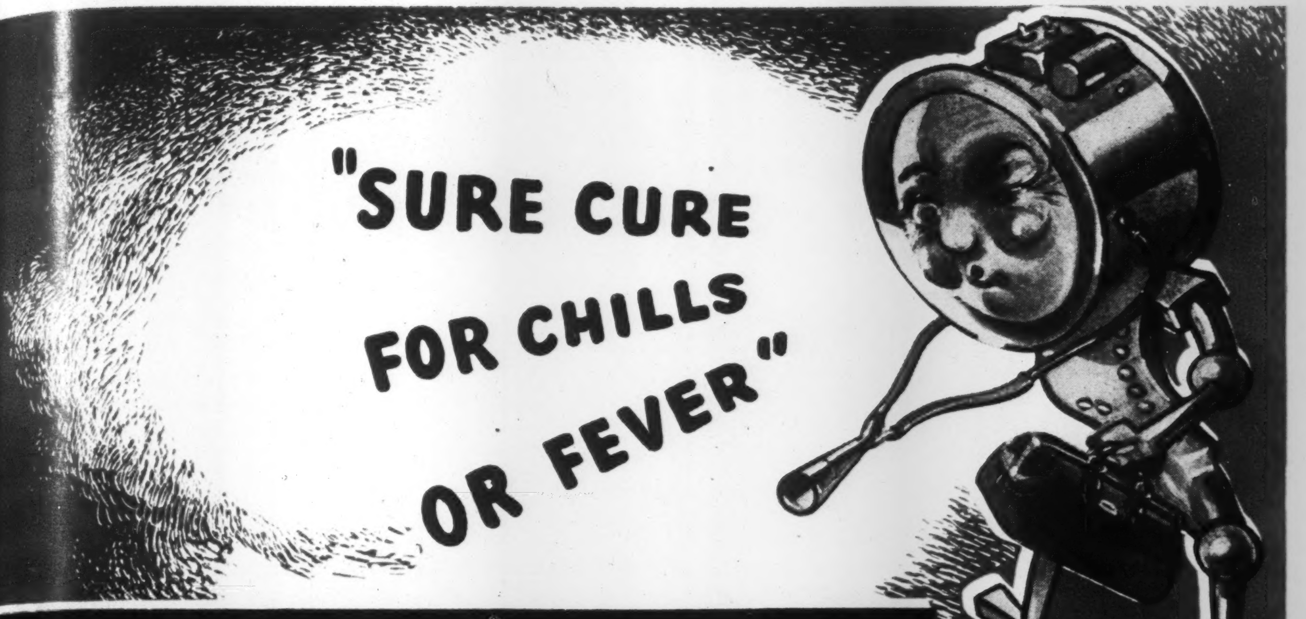
**WORKING PRESSURES**

| Size of Valve | Screwed or Flanged End Valves | | Hub End Valves |
|---|---|---|---|
| | Saturated Steam | Cold Water, Oil or Gas, Non-Shock | Cold Water or Gas Non-Shock |
| 2 to 12 in. | 125 pounds | 200 pounds | 200 pounds |
| 14 and 16 in. | 125 pounds | 150 pounds | 150 pounds |
| 18 to 24 in. | * | 150 pounds | 150 pounds |

*For steam lines larger than 16-in., Crane 150-Pound Cast Steel Gate Valves are recommended. (For sizes under 2-in., use Crane Clamp Gate Valves.)

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. • *Branches and Wholesalers Serving All Industrial Area*

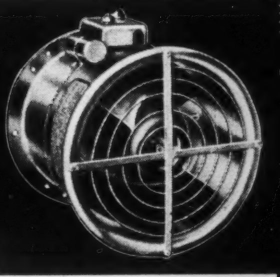
**CRANE** 90 YEARS OF PROGRESS 1855 1945 **VALVES • FITTINGS • PIPE**
**PLUMBING • HEATING • PUMPS**



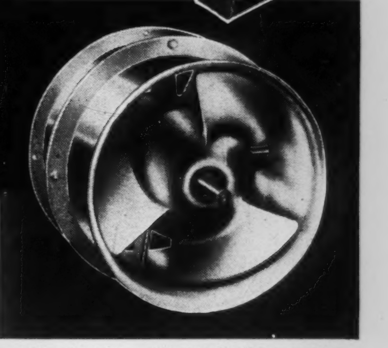
1921-C — Delivers 15 CFM @ .4" S.P., 12,500 RPM. Overall length 4"; diameter 2-3/4"; weight 7 oz. (1/500 HP).

2881-A — Delivers 50 CFM @ .6" S.P., 9400 RPM. Overall length 4-1/8"; diameter 3-3/4"; weight 18 oz. (1/100 HP).

4581-A — Delivers 180 CFM @ 1." S.P., 7500 RPM. (1/12 HP). Overall length 6-7/16"; diameter 5-3/4"; weight 4 lbs. 2 oz.



5861-C — Delivers 400 CFM @ 1." S.P., 6300 RPM. (1/10 HP). Overall length 6-7/16"; diameter 7-1/16"; weight 5 lbs. 4 oz.



121 — Delivers from 1000 CFM @ .4" S.P. at 1750 RPM to 4300 CFM @ 7" S.P. at 7200 RPM for belt or direct drive, also available with built-in 3-phase motor. Overall length 10-1/2"; diameter 15".

# DYNAMIC AIR AXIAL FLOW BLOWERS

*. . . save weight, space and power input*
*. . . deliver more air against high pressures**

Whether you want just a breath of air movement to cool a tiny hot spot, or a gale for ventilation — hot or cold — there's a Dynamic Air Axial Flow Blower that will do it quicker and better. Here's why —

1. ***They save 2/3 the space*** required by bulky, old fashioned, centrifugal blowers.
2. ***They weigh less than 1/2*** as much as the old fashioned types.
3. ***Much less power input*** is required for a specified amount of air delivery.

All of these advantages are the ***direct*** result of the ***direct*** air flow that is possible only with axial flow.

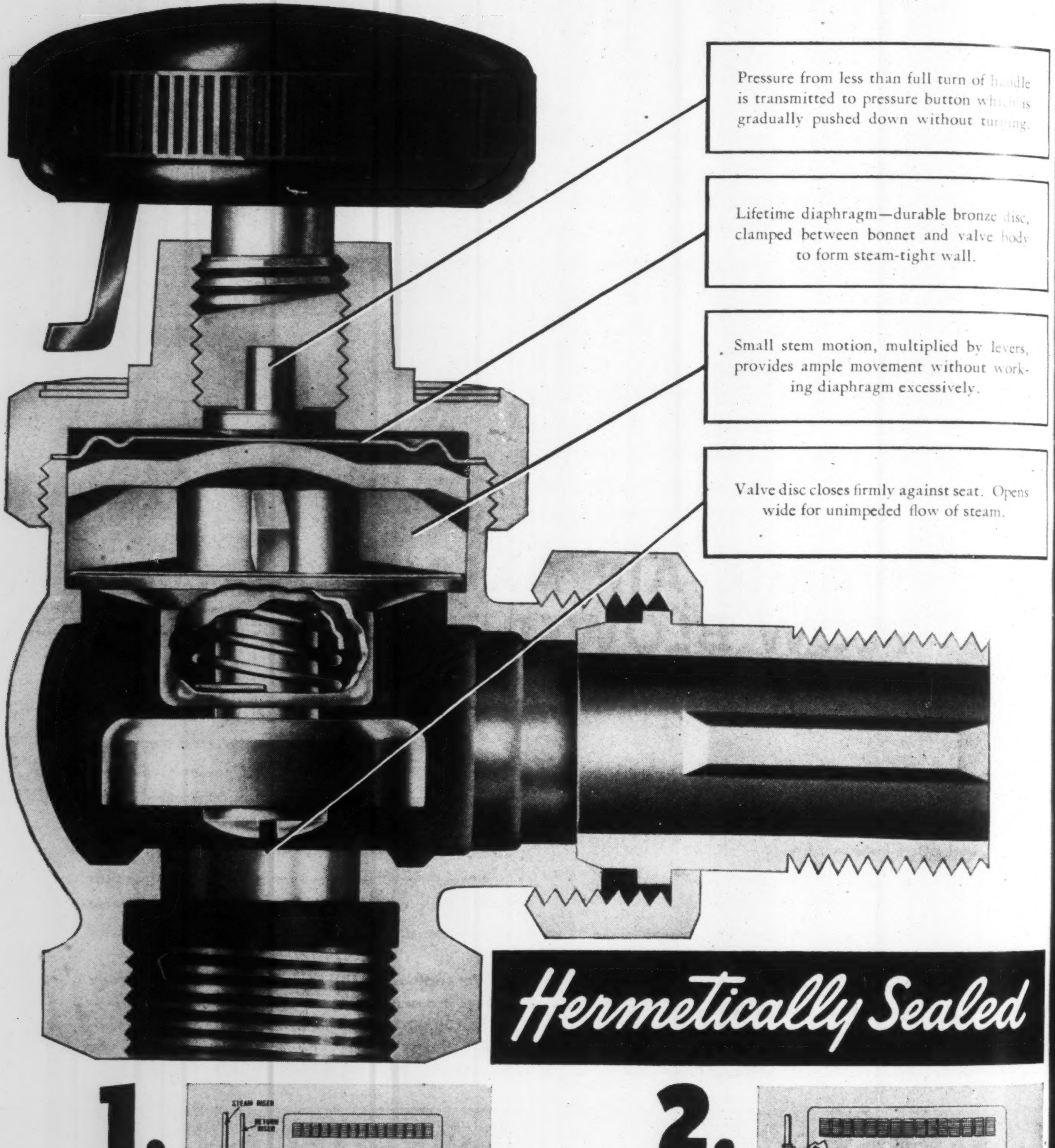
Based on 14 years of development, Dynamic Air Axial Flow Blowers represent the most advanced application of this principle. They bring you great possibilities for air engineering against static pressures as high as 10" or more W.G.

All are designed to rigid performance and weight specifications. Adaptations can be made to the most precise requirements. ***Consult us about your blower problem.***

****In addition to the typical models shown, many others are available in single and two stage ratings up to 100,000 CFM @ 10" S.P., with motors in standard voltages and cycles. You'll find the one you need in the Dynamic line.***

**DYNAMIC AIR ENGINEERING Inc.**
LOS ANGELES, U. S. A.
DESIGNERS AND BUILDERS OF HIGH EFFICIENCY AXIAL-FLOW EQUIPMENT

# AT LAST



Pressure from less than full turn of handle is transmitted to pressure button which is gradually pushed down without turning.

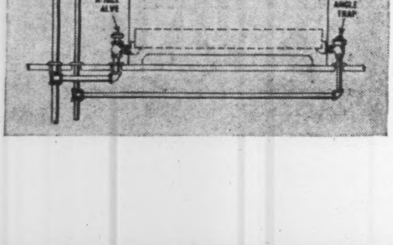
Lifetime diaphragm—durable bronze disc, clamped between bonnet and valve body to form steam-tight wall.

Small stem motion, multiplied by levers, provides ample movement without working diaphragm excessively.

Valve disc closes firmly against seat. Opens wide for unimpeded flow of steam.

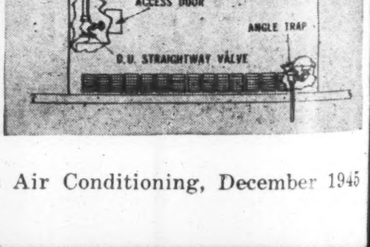
## *Hermetically Sealed*

**1.**



**Lifetime Angle Valve and B-1 Angle Trap used with Trane Convector-radiator where horizontal laterals are below the floor.**

**2.**



**Lifetime Double Union Straightway Valve and B-1 Angle Trap inside Convector-radiator cabinet. Downfeed steam riser.**

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**Valves**
**Traps c**

# A TRULY PACKLESS VALVE

## WITH A LIFETIME*GUARANTEE

**PERMANENTLY ELIMINATE STEAM LEAKAGE AND MAINTENANCE WORRIES . . .**

**SPECIFY TRANE No. 44 LIFETIME VALVE**

THIS TRANE VALVE will never need to be replaced. Install it and forget it. It is simple, rugged, everlasting, and it carries Trane's lifetime guarantee against stem leakage. It is especially adapted for service on Convector-radiators, and other heating equipment used on vapor, vacuum, two-pipe steam, and forced circulation hot water systems. Complete range of sizes and patterns.

How is it different? A tough bronze diaphragm forms a hermetic seal between the stem and the valve body. It seals steam and water in, seals air out. A slight "oil can" effect moves the center of the disc while the edges remain firmly sealed to the body of the valve. And an ingenious lever device triples the effect of this movement, minimizing mechanical strain on the Lifetime Diaphragm.

No leaky packing or stuffing box. No bellows. The Trane Valve is truly packless; made to last a lifetime. It is sturdily built with heavy cast brass body and bonnet. Cool plastic handle with indicator disclosing valve setting. Valve discs are high temperature, non-swelling, non-shrinking, perma-type composition.

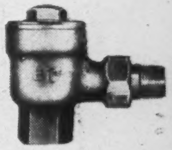
Be sure to specify Trane No. 44 Hermetic *Lifetime* Valve. For information, technical and installation details, send in your reservation at once for the new Trane Heating Specialties Bulletin DS-260, now on press. It will contain complete information on all Trane Steam Heating Specialties.

---

**If stem leakage occurs at any time in the normal life of any properly used Trane Lifetime Valve, a new Lifetime Diaphragm will be mailed to the heating contractor by the Trane Company without charge.*

**ALWAYS TEAMED FOR LONG LIFE**

**NO. 44 LIFETIME VALVE**



**THERMOSTATIC TRAP**

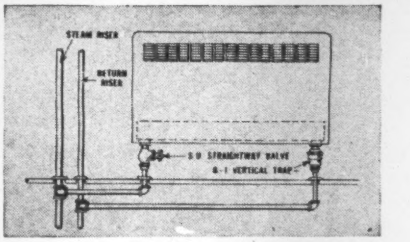
This trap improves the performance of vapor, vacuum, and steam heating equipment. It closes against steam, opens to pass air and condensation. The remarkable Trane bellows is supersensitive in performance, free-working and built for long life. Like the Lifetime Valve, you can install it and expect long years of excellent service with a minimum of attention.

Trane has a complete line of thermostatic traps up to pressures of 200 pounds. For ease of maintenance, to cut heating costs, always specify the Trane Lifetime Valve and Thermostatic Bellows Traps together.

## FOR LONGER LIFE, EFFICIENT SERVICE

**3.**

Lifetime Single Union Straightway Valve and B-1 Vertical Trap. Horizontal laterals below floor. Globe and Corner Valves as well as Offset Traps are also available.

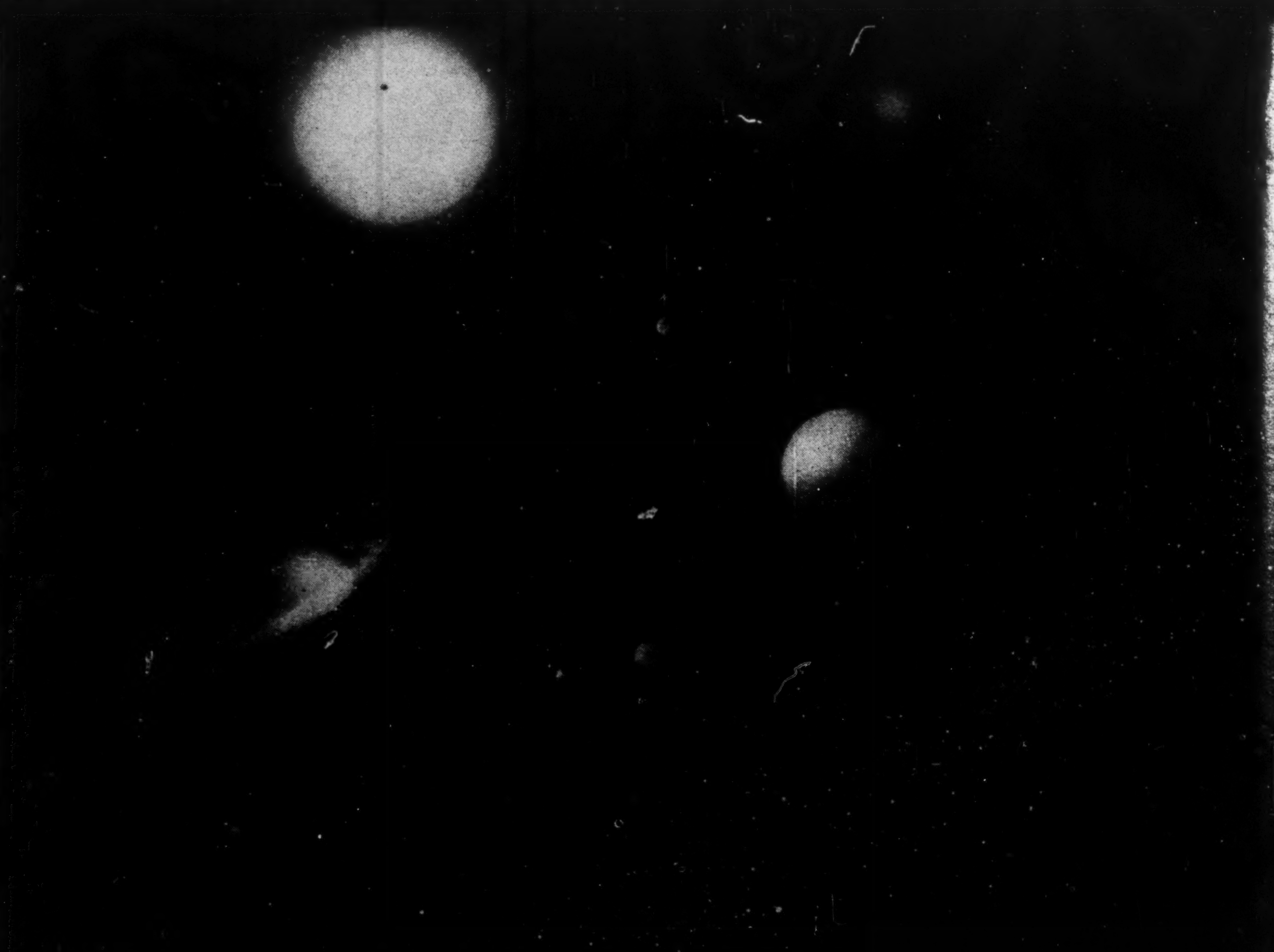


**THE TRANE COMPANY**

**FIRST IN ENGINEERED CLIMATE**

MANUFACTURING ENGINEERS OF HEATING, COOLING,
AIR CONDITIONING AND AIR HANDLING EQUIPMENT

**LA CROSSE, WISCONSIN**



# They all REVOLVE

**. . . the warmth-giving Sun . . . the life-producing Earth . . . the energizing Atom!**

Like the sun, the earth, the atom, the Wing Unit Heater REVOLVES. It keeps the heated air in gentle motion, slowly circulating a constant, uniform, EVEN temperature, transforming hot and cold spots into comfortable, energizing, productive areas. The circulating heated air from the slowly revolving discharges reaches to farthermost corners, gets around and under obstructions, eliminates hot spots and cold spots.

Install Wing Revolving Unit Heaters now. Not only will they heat your plant comfortably and evenly, bringing a sensation of fresh, live, invigorating warmth to workers, but in the Summer, with the steam turned off and the fans on, they create a pleasant, cooling air motion over the entire area. *Write for Bulletin HR*

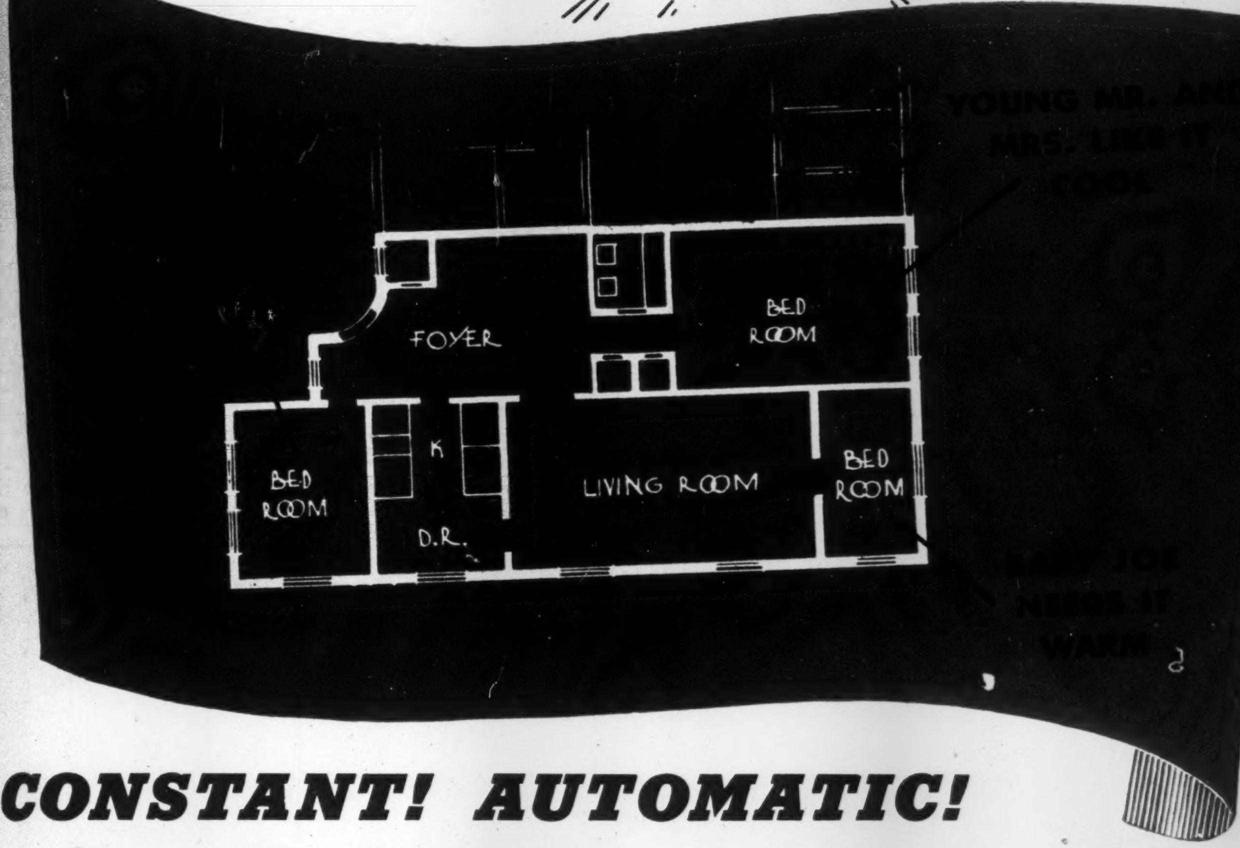
**L. J. Wing Mfg. Co.** 154 W. 14th St. · New York 11, N. Y.
*Factories: Newark, N. J. and Montreal, Canada*

**Wing**

**REVOLVING UNIT HEATERS**

TURBINE BLOWERS · TURBINES · MOTOR DRIVEN BLOWERS · VENTILATING FANS · DUCT FANS · HEATING UNITS · SHIP VENTILATORS

# Now they're One happy family!


FOYER
BED ROOM
K
LIVING ROOM
BED ROOM
BED ROOM
D.R.
YOUNG MR. AND MRS. LIKE IT COOL
BABY JOE NEEDS IT WARM

# CONSTANT! AUTOMATIC!

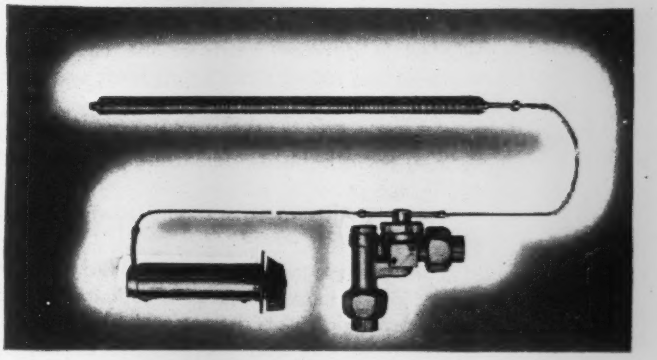
## Each room a "Pre-set" temperature with new No. 522 Regulators!

SPECIAL! What about that tough job calling for control of hot water flow to concealed radiators? Or the one for reheaters in a heating and ventilating system? Here's the answer to both . . . the Fulton Sylphon Regulator No. 522.

You can't miss with this instrument. It's precise, sensitive, easily set. Materials are highest quality; design and construction, Fulton Sylphon's finest, result of more than 40 years' experience.

**Heart of the control unit** is the famous Fulton Sylphon metallic bellows—providing self-powered, long-lasting, trouble-free service.

Yes, it will pay you to get the facts. Just write for Bulletin XH-820. The Fulton Sylphon Co., Knoxville 4, Tennessee. Canadian representatives, Darling Brothers, Montreal.



**Recent Addition! No. 522 is comparatively new . . . developed to meet demand for flexibility in hot water heating. Temperature adjustable over any 20-degree range between 40 degree F. and 120 degree F. Normal differential only 3 degrees F. Standard length of tubing 48″. Valve size ½″.**

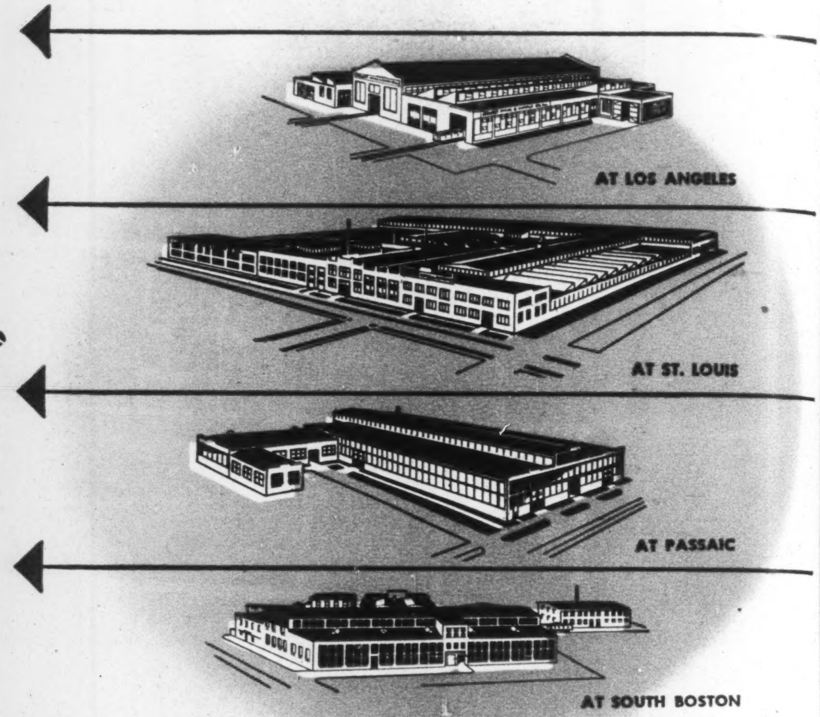
FIRST WITH BELLOWS

**FULTON SYLPHON**

BELLOWS • BELLOWS ASSEMBLIES

TO THE USER OF FABRICATED PIPING

4 PLANTS *Are Better* THAN 1



There are four Midwest pipe fabricating plants located in different parts of the country, because Midwest has found that "four plants are better than one" for the user of piping.

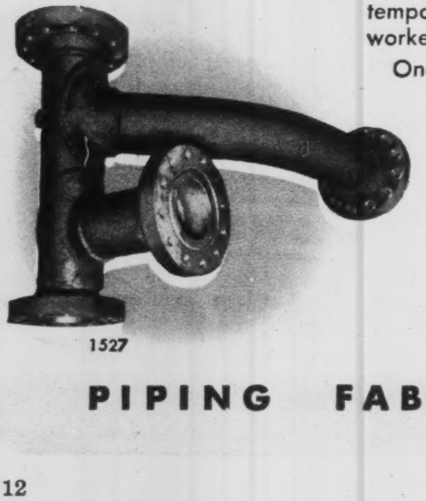
In addition to shortening shipping distances and making for a better understanding of the customers' individual problems, four plants provide other important benefits in which all Midwest Piping users participate.

Extra reserve capacity is provided for the emergency job. If extreme speed is sufficiently important, a job can be divided among two or more plants. An overload in one plant often can be handled by temporarily transferring skilled workers from other plants.

One of the greatest advantages is the continuous exchange of information and experience between staff members of the four plants. New techniques developed in one plant are made known to all. Piping problems which may be new to one plant probably are very familiar to another where the "know how" information is available at once. Friendly rivalry—constant study of piping problems by four organizations—tends to advance the art of piping fabrication much more rapidly than would otherwise occur.

All of this works to the advantage of piping users —four plants are better than one.

Midwest can give you better piping and better service . . . whether you need only a simple bend or the most elaborate piping job completely erected and ready for operation.

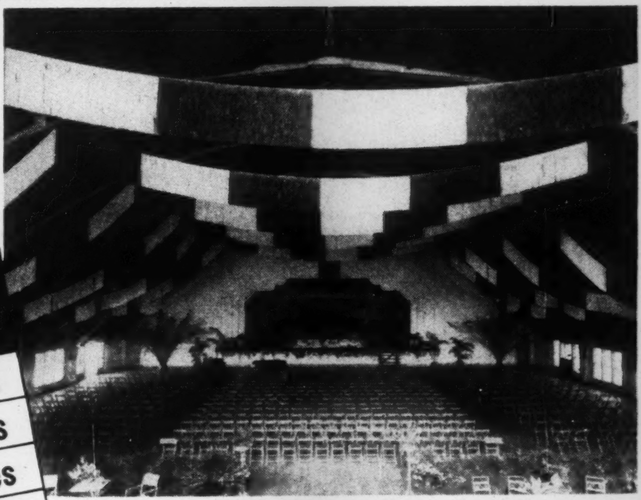


1527

MIDWEST PIPING AND SUPPLY COMPANY, Inc.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic (N. J.) and Los Angeles
Subsidiary: Lumsden & Van Stone Co., South Boston 27, Mass.
Sales Offices: New York 7—30 Church St. Chicago 3—645 Marquette Bldg.
Los Angeles 33—520 Anderson St. Houston 2—229 Shell Bldg.
Tulsa 3—533 Mayo Bldg. Atlanta 3—Red Rock Bldg. South Boston 27—426 First St.

PIPING FABRICATORS AND CONTRACTORS

# *Yes*... REZNOR UNIT HEATERS



**Q.** Are Reznor Unit Heaters designed for heating more than one type of building?

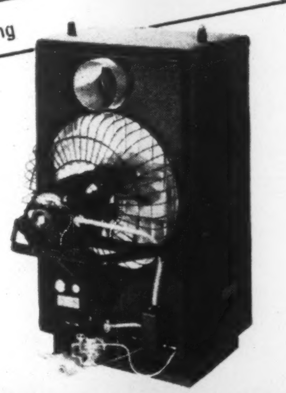
**A.** Yes! They can be used for all types of buildings.

| For instance, can these self-contained heaters be used for these installations? | |
|---|---|
| Public Buildings | Yes |
| Schools | Yes |
| Churches | Yes |
| Retail Stores | Yes |
| Small Plants | Yes |
| Large Plants | Yes |
| Bowling Alleys | Yes |
| Homes | Yes |
| Offices | Yes |
| Storerooms | Yes |
| Warehouses | Yes |
| Restaurants | Yes |
| Garages | Yes |
| Any type of building | Yes |

In other words, if you have a space to be heated, you can use Reznor Unit Heaters. They provide safe, clean heat and you need no auxiliary equipment or firemen . . . turns off and on as needed . . . no waste . . . pay only for fuel used.

Made in 3 types (fan, blower, and duct) and there are 9 different sizes of each type.

★ ★ ★

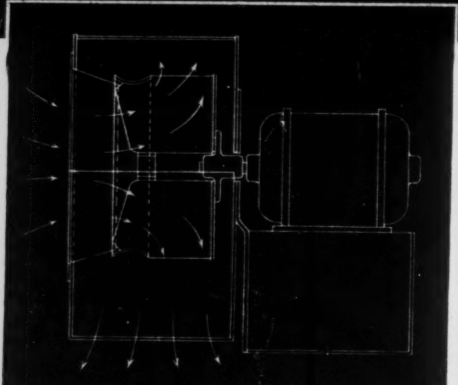


REZNOR MFG. CO. **REZNOR** JAMES ST., MERCER, PA.

*"GAS HEATERS EXCLUSIVELY SINCE 1888"*

DO IT WITH A

Sturtevant



**NOISE-REDUCING INLET,** shown above, is cone-shaped . . . guides the entering air to the rotor with a minimum of shock and turbulence, assuring *exceptionally quiet* operation.

**HERE'S HOW STURTEVANT ACHIEVES SUPER-QUIET OPERATION—PLUS THESE OTHER ADVANTAGES!**

1. Streamlined, noise-killing inlet. (See diagram at left).
2. Rugged, straight radial blade rotor, with broad-curved hoop, streamlines path of entering air, greatly reduces noise, permits peak efficiency at medium speed, assures better balance when air contains grease or solid particles.
3. Housing is extra sturdy . . . furniture steel . . . rigid, *airtight* beaded construction.
4. Direct-drive eliminates need of intermediate bearings, makes installation simplicity itself.

# WHISPER INSTEAD OF A ROAR

## Give stale air a quiet exit with Sturtevant's Super-Quiet REXVANE VENTILATING SET

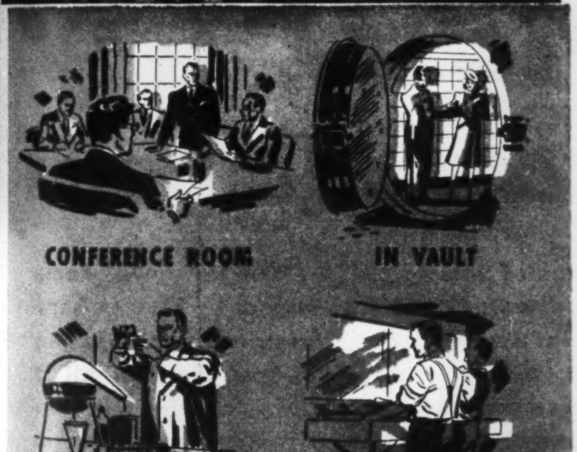
THIS STURTEVANT VENTILATING SET is the nearest thing to a completely noiseless "way out" for bad air. It substitutes a *mere whisper* for a roar.

Why so quiet? *Answer:* Lower outlet velocities; noise-reducing inlet design; and a new-type straight radial blade rotor. Check these and other outstanding Sturtevant features briefly described at the left.

Here's a small, compact, highly efficient, ready-to-run centrifugal fan—ideal for hundreds of "small area" ventilating jobs—especially where quiet operation is essential. Chemical laboratories, plating baths and other fume-creating equipment, toilets, washrooms, vaults, movie projection booths, conference rooms, kitchens—these are but a few of the many places where the Rexvane Set will do a highly satisfactory job.

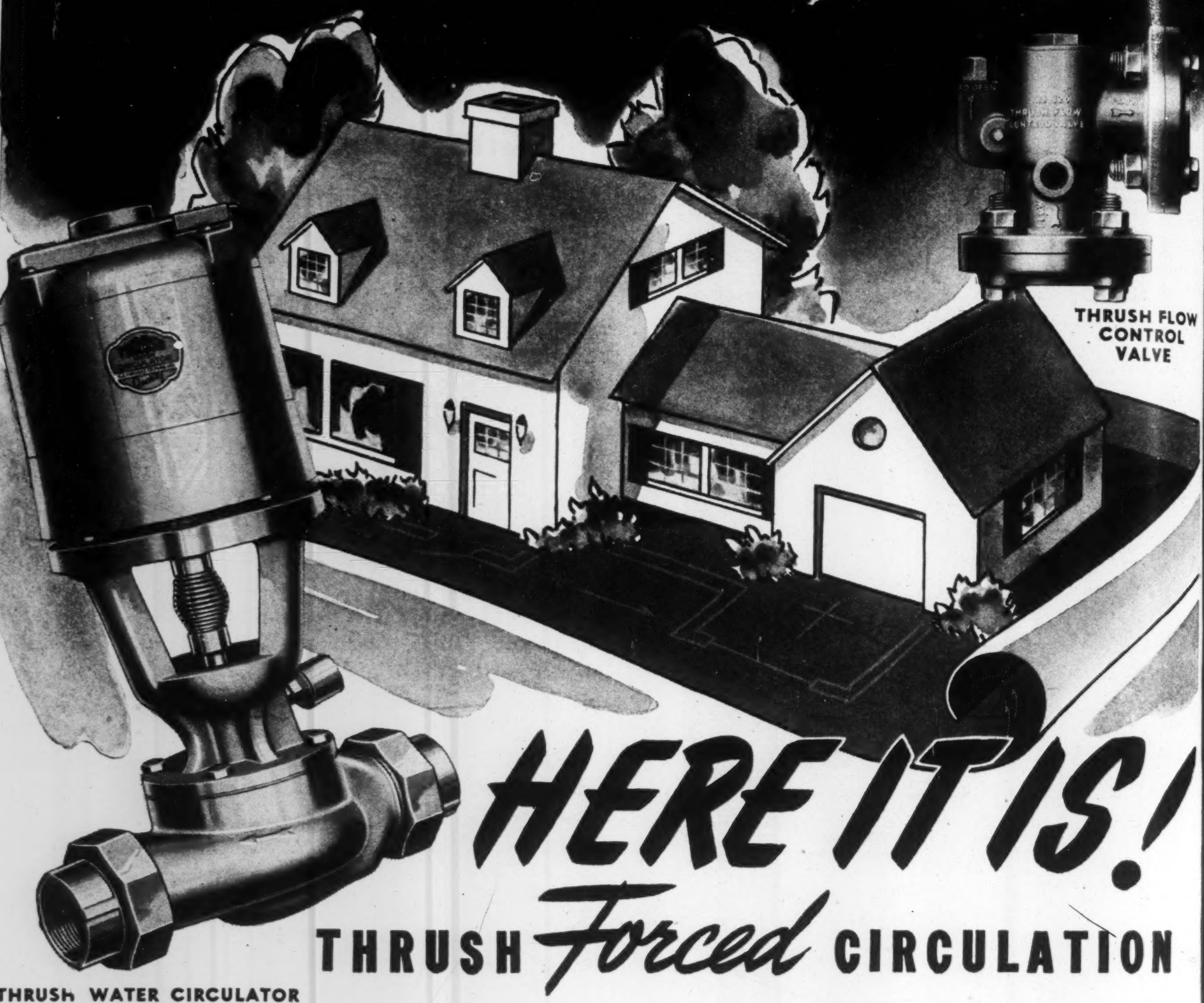
Nine sizes of Rexvane Ventilating Sets are now available, with rotors ranging from 6″ to 24″ in diameter, and capacities from 250 cfm to 6,000 cfm. Write for Bulletin No. 406, containing complete data . . . or let a local Sturtevant Field Engineer help you select the right equipment for your particular exhauster needs.

B. F. STURTEVANT COMPANY
*Division of Westinghouse Electric*
HYDE PARK, BOSTON 36, MASS.



**Sturtevant**
REG. U.S. PAT. OFF.
*Puts Air to Work*

# Tomorrow's Heating Plant



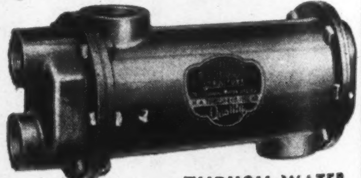
# HERE IT IS!

## THRUSH *Forced* CIRCULATION

THRUSH WATER CIRCULATOR

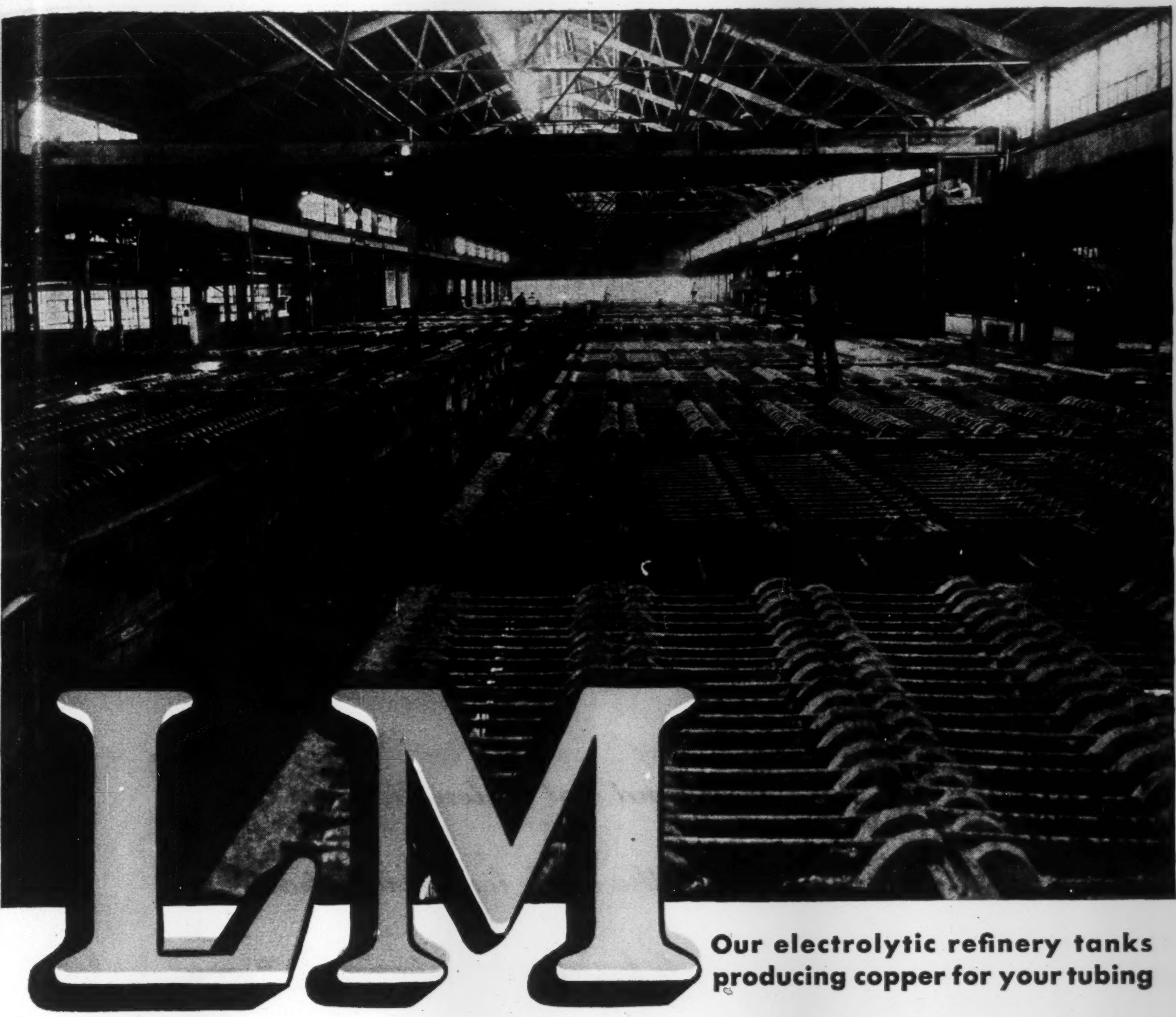
**AUTOMATIC** heating is a "must" in the homes of tomorrow . . . and the finest home heating is not merely a blueprint for postwar development . . . it's an actuality that is here right now! Thrush Forced Circulating Hot Water Heat assures that uniform, effortless heating and real home comfort which every one is seeking, with true fuel economy. Best of all it provides year around domestic hot water supply from the same heating installation very inexpensively. Are you keeping in touch with the plans of home builders and home seekers in your community? Tell them about Thrush Flow Control System and help write this better home heating into the specifications. You should also recommend Thrush equipment for modernization work now. If not familiar with Thrush products, see your wholesaler today or write Dept. E-12.

**H. A. THRUSH & COMPANY • PERU, INDIANA**



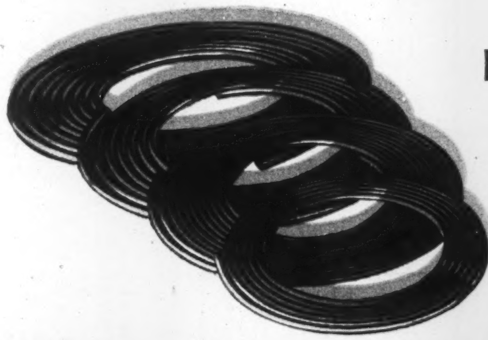
THRUSH WATER HEATER

*Summer-Winter Hot Water Heat!*



Our electrolytic refinery tanks producing copper for your tubing

**SEAMLESS COPPER TUBING**



**FROM REFINERY TO PACKAGED PRODUCT— ALL IN THE SAME PLANT**

**LEWIN MATHES**

LEWIN-MATHES COMPANY · · SAINT LOUIS, MISSOURI

*Peace and rest at length have come*
*All the day's long toil is past*
*And each heart is whispering "Home,*
*Home at last"*

**THOMAS HOOD**

SPANG-CHALFANT
Division of The National Supply Co.
EXECUTIVE OFFICES: PITTSBURGH, PA.
District Sales Offices: Atlanta; Boston; Chicago; Denver; Detroit; Houston; Los Angeles;
New York; Philadelphia; Pittsburgh; St. Louis; San Francisco; Tulsa; Washington.

WHITE-
RODGERS
ELECTRIC CO.
ST. LOUIS MO. U.S.A.
TYPE
HOT WATER
CONTROL
NO.
STYLE

# Make a Good Product ^SELL Better With WHITE-RODGERS Automatic Temperature Controls

Make it right — then make it automatic. Compact, efficient, accurate White-Rodgers Hydraulic-Action temperature controls give your product the "extra" that means the big difference in selling. Predominantly used in heating, refrigeration and air-conditioning. Readily adaptable on any application requiring accurate control of temperature. Add this selling-working force to your products. Write today for catalog and installation data.

**Here's How It Works:**

**CONTRACTED**

At left is a cross-section of the diaphragm and part of the liquid-filled capillary. The liquid has contracted, the diaphragm moving inward, causing the switch to function.

**EXPANDED**

In view at left, the liquid charge of the capillary has expanded with a rise in temperature. This positive force moves the diaphragm outward and causes the switch to function.

WHITE-
RODGERS

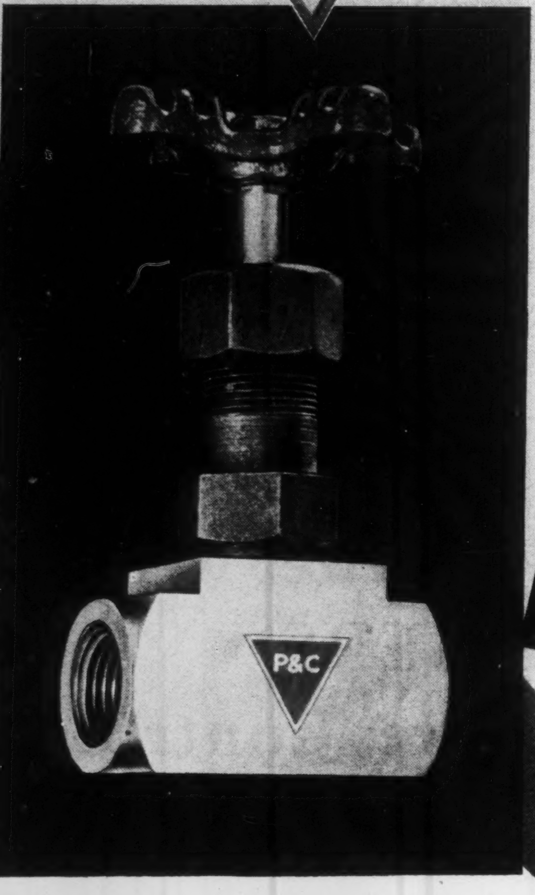
WHITE-RODGERS ELECTRIC CO.
ST. LOUIS 6, MISSOURI
*Controls for Refrigeration • Heating • Air Conditioning*

# A *Tough* LITTLE VALVE OF ALL WORK

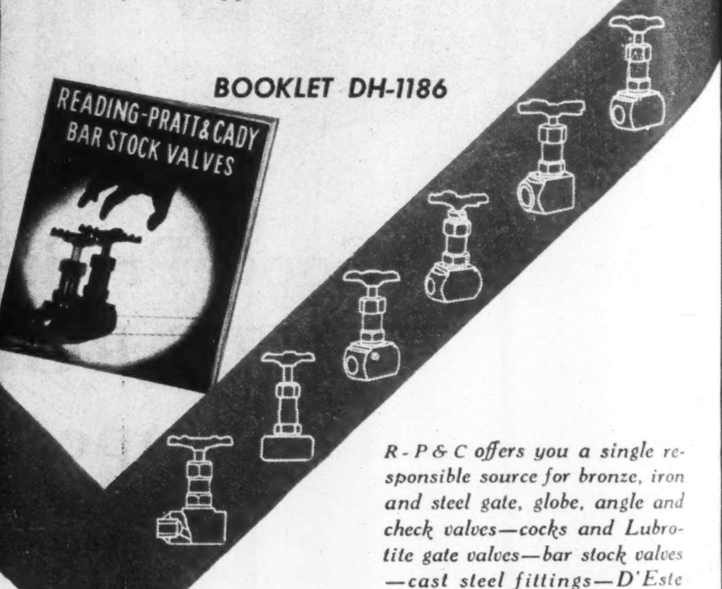
● This line of "bar stock" valves was developed by R-P&C as rugged, economical, close control valves. But experience in service quickly demonstrated their usefulness practically anywhere that a small, tough valve is needed for either close control, normal regulation or shut-off. Their service, pressure and temperature ratings extend over a wide range.

R-P&C bar stock valves are in stock in globe and angle types, made of bronze, carbon steel, 12-14% stainless steel, combination carbon steel and 12-14% stainless steel and in 18 and 8 stainless steel—in sizes up to 1".

Let us give you complete information about R-P&C bar stock valves. It is contained in a file size booklet—DH-1186. We will be glad to send you a copy.



**BOOKLET DH-1186**



*R-P&C offers you a single responsible source for bronze, iron and steel gate, globe, angle and check valves—cocks and Lubro-tite gate valves—bar stock valves—cast steel fittings—D'Este Automatic Regulating Valves.*

## READING-PRATT & CADY

MANUFACTURERS OF
READING CAST STEEL VALVES AND FITTINGS • PRATT & CADY BRASS AND IRON VALVES
D'ESTE AUTOMATIC REGULATING VALVES

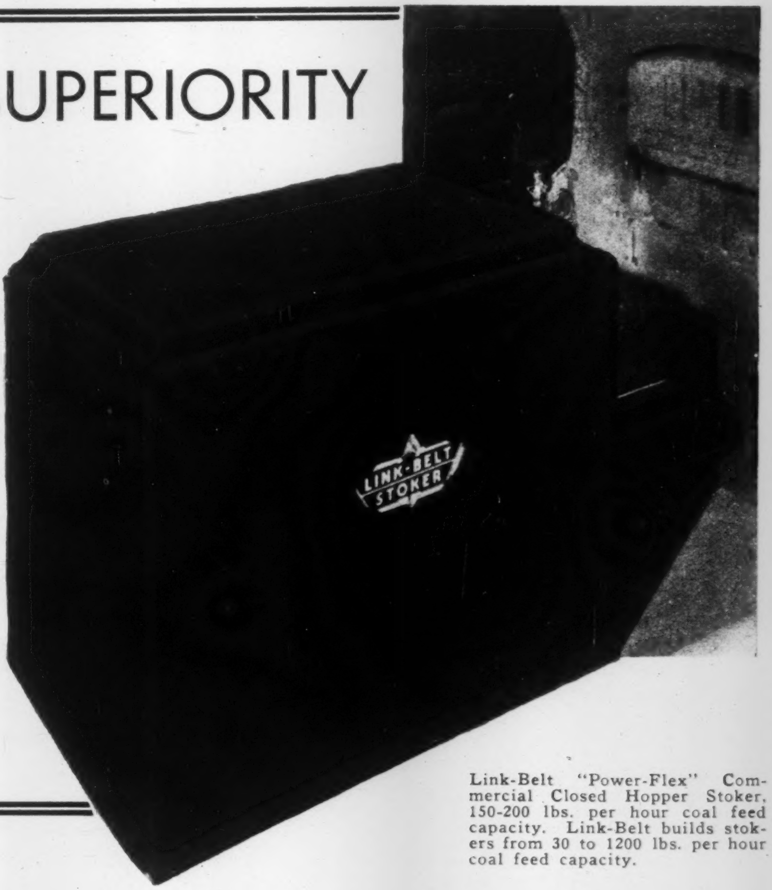
**ACCO**

Reading, Pa. • Atlanta • Chicago • Denver • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco • Bridgeport, Conn.

**READING-PRATT & CADY DIVISION**
**AMERICAN CHAIN & CABLE**

ACCO
TRADE MARK

# MECHANICAL SUPERIORITY IS THE RESULT OF TECHNICAL EXPERIENCE

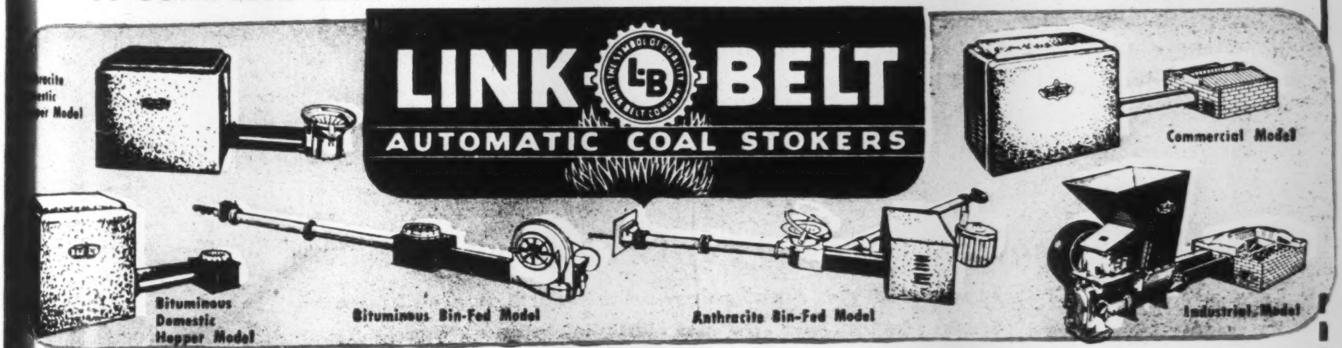


Link-Belt "Power-Flex" Commercial Closed Hopper Stoker, 150-200 lbs. per hour coal feed capacity. Link-Belt builds stokers from 30 to 1200 lbs. per hour coal feed capacity.

Mechanical superiority in stokers means easier selling, fewer service calls, greater user satisfaction and more dealer and distributor profit. But mechanical superiority doesn't "just happen"; it is only the result of technical experience. Radar, for example, wasn't just an invention; its development dates back to 1849 when the "reflected ray" principle was used to determine the speed of light.

Link-Belt has been developing better methods in combustion, fuel handling and power transmission since 1875. We believe that the Link-Belt stoker represents more basic improvements than any other automatic coal burner on the market . . . because this organization has the engineering talent, the laboratory development and the manufacturing facilities to give both dealers and customers the best product available.

## A COMPLETE LINE UP TO 1200 LBS. PER HOUR COAL FEED CAPACITY



LINK-BELT
THE SYMBOL OF QUALITY LB LINK-BELT COMPANY
AUTOMATIC COAL STOKERS
racite
estic
er Model
Commercial Model
Bituminous Domestic Hopper Model
Bituminous Bin-Fed Model
Anthracite Bin-Fed Model
Industrial Model

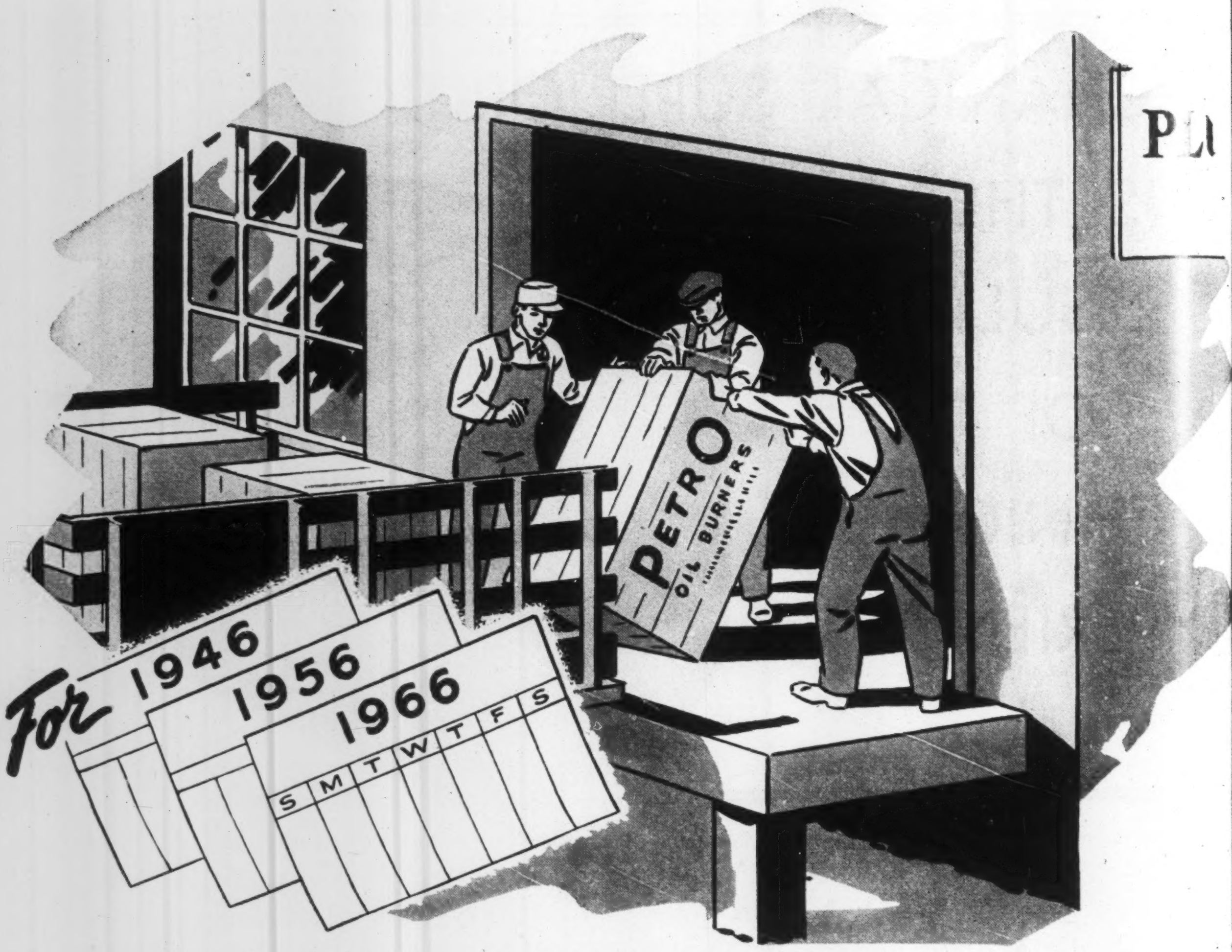
AUTHORIZED LINK-BELT STOKER DISTRIBUTOR

**LINK-BELT COMPANY** *Stoker Division,* 2410 W. 18th St., Chicago 8, Ill. 10152

I am interested in the Link-Belt Stoker Sales Franchise

NAME____________________ FIRM____________________

ADDRESS____________________ CITY________________ STATE__________



# ...YOUR BEST ASSURANCE OF EVER-GROWING OIL BURNER SALES IS PETRO

ANYONE CAN SELL oil heating equipment today. But to maintain volume sales in the years after the first brisk demand has levelled off, it will mean getting there first with oil burners that have the most to offer!

The new Petro Oil Heating Equipment not only will have many *new* sales features to give you this selling advantage, but will be value-priced to meet the toughest competition! New improvements in design insure continued Petro popularity with burners well-known for their economical and dependable operation. An attractive . . . styled-for-eye-appeal line covers the complete capacity range for both "conversion" burners and "units".

And of particular value to you . . . every Petro Oil Heating System you install means a satisfied customer. It is your best assurance of volume sales in 1956 and 1966 as well as today! *Petro Oil Heating Equipment is distributed through heating wholesalers.*

*Write for your nearest heating wholesaler today!*

**PETROLEUM HEAT AND POWER COMPANY • Stamford, Conn.**

Petro Fuel Oil bulk plants, distributing terminals and facilities in: Mt. Vernon • Newark • New York
Baltimore • Stamford • Boston • Long Island • Washington • Providence • Philadelphia • Chicago

OHI

**PETRO**
REG. U. S. PAT. OFF.

**MAKERS OF
GOOD OIL BURNING
EQUIPMENT SINCE 1903**

# *Meet* *Demon Heat*

Heat's a stealthy thief — always sneaking in to rob business of profits in countless ways.

Marlo Fin Coils outwit Demon Heat through efficient heat transfer. Our engineers have a quarter-century's priceless experience at your disposal.

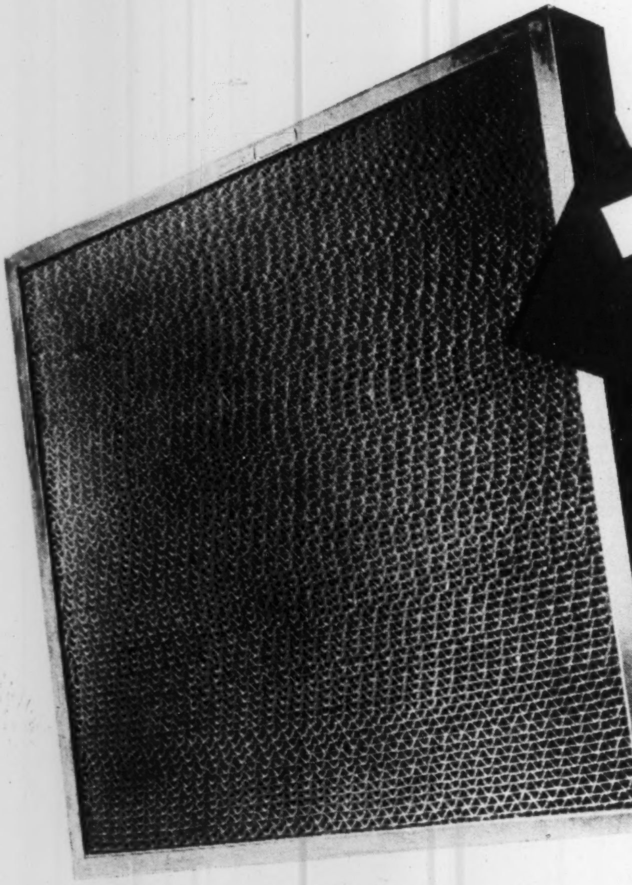
**MARLO = HEAT TRANSFER**

## MARLO
## HEAT TRANSFER SURFACE

**Ball-Bonded Blast Coils—Cooling and Heating • Air Conditioning and Refrigeration Apparatus • Industrial Blower Units • Unit Coolers • Evaporative Condensers and Coolers • Low Temperature Apparatus.**

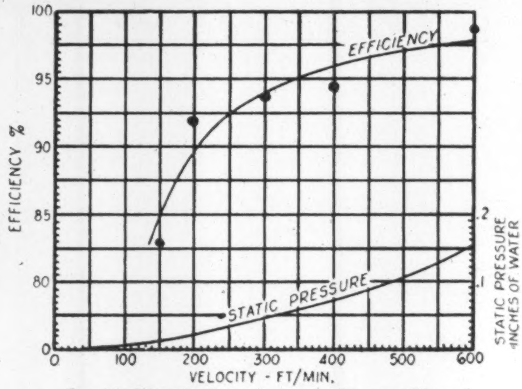
# MARLO COIL COMPANY

**ST. LOUIS 10, MISSOURI**



# THIS

is a
MORE EFFICIENT
GREASE FILTER



Far-Air Filter Performance as a Grease Filter

# FAR-AIR

## FILTERS GIVE CERTIFIED PERFORMANCE!

Under tests, conducted by S. F. Duncan, associate Professor of Mechanical Engineering, University of Southern California, it has been definitely established that grease filters, to be efficient, must trap the grease globules through impingement. Furthermore, it was proved that when air velocities were increased (causing greater air turbulence within the filter media) the efficiency of the filter increased.

Because grease is carried into the air as tiny globules—and not as a vapor—IMPINGEMENT and not condensation is the correct answer to efficient grease filter performance. Far-Air Filters with 80% more impingement area, plus ability to produce greater air turbulence through higher velocities, give you optimum conditions for grease collection.

Remember . . . only with Far-Air patented Herringbone Construction do you get greater holding capacity, more air delivery and easier cleaning.

For full information and copies of the S. F. Duncan Test Report, write: Farr Company, Dept. No. HPA, 2615 Southwest Drive, Los Angeles 43, California.

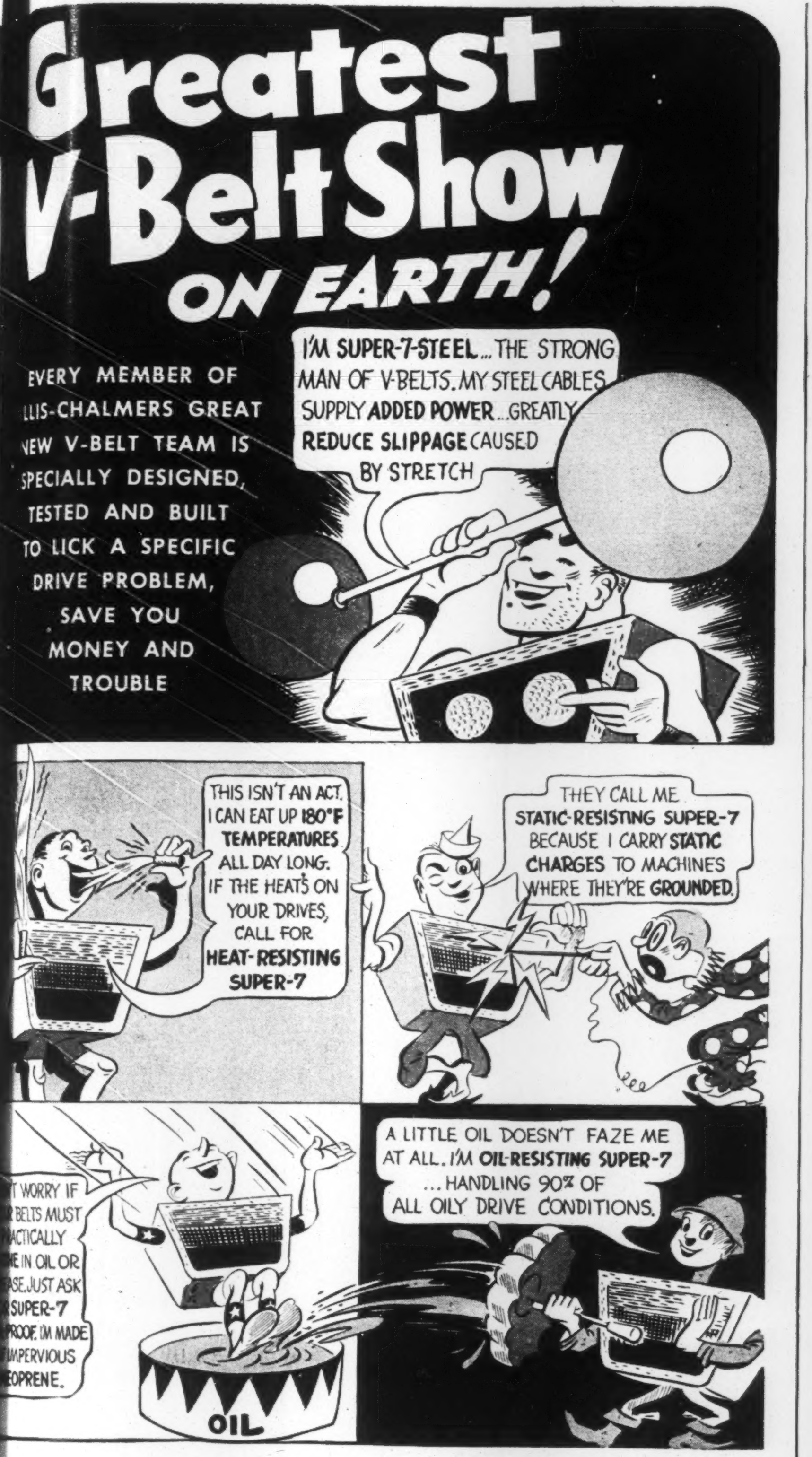
***herringbone- -corrugations***

"Better by Farr"

**FARR COMPANY**
MANUFACTURING ENGINEERS
LOS ANGELES CALIFORNIA

SALES OFFICES BALTIMORE . BOSTON . BUFFALO . CHICAGO
CINCINNATI . CLEVELAND . COLUMBUS . DAYTON . DETROIT
HAMMOND IND . HOUSTON . INDIANAPOLIS . KANSAS CITY, MO
LOS ANGELES . LOUISVILLE . MILWAUKEE . MINNEAPOLIS . NEW ORLEANS
NEW YORK . OMAHA . PHILADELPHIA . PITTSBURGH . ROCKFORD, ILL
ST LOUIS . SALT LAKE CITY . SAN FRANCISCO . SEATTLE
SPRINGFIELD MASS . TAMPA . WASHINGTON, D.C.
CANADIAN REPRESENTATIVES MONTREAL . TORONTO

# Greatest V-Belt Show ON EARTH!


EVERY MEMBER OF LLIS-CHALMERS GREAT NEW V-BELT TEAM IS SPECIALLY DESIGNED, TESTED AND BUILT TO LICK A SPECIFIC DRIVE PROBLEM, SAVE YOU MONEY AND TROUBLE
I'M SUPER-7-STEEL... THE STRONG MAN OF V-BELTS. MY STEEL CABLES SUPPLY ADDED POWER... GREATLY REDUCE SLIPPAGE CAUSED BY STRETCH
THIS ISN'T AN ACT. I CAN EAT UP 180°F TEMPERATURES ALL DAY LONG. IF THE HEAT'S ON YOUR DRIVES, CALL FOR HEAT-RESISTING SUPER-7
THEY CALL ME STATIC-RESISTING SUPER-7 BECAUSE I CARRY STATIC CHARGES TO MACHINES WHERE THEY'RE GROUNDED.
T WORRY IF R BELTS MUST ACTICALLY E IN OIL OR ASE. JUST ASK SUPER-7 PROOF. I'M MADE IMPERVIOUS EOPRENE.
A LITTLE OIL DOESN'T FAZE ME AT ALL. I'M OIL-RESISTING SUPER-7 ... HANDLING 90% OF ALL OILY DRIVE CONDITIONS.
OIL

Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices. It pays to make Allis-Chalmers your V-belt drive headquarters.

**ALLIS-CHALMERS**

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

A 1961

# BULLETIN!

## SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

### Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

### SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real timesaver . . . leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

### HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 96, ALLIS-CHALMERS MFG. CO. Milwaukee 1, Wis.

ALLIS-CHALMERS MFG. CO.
Dept. 96, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

Company..............................

Address..............................

.....................................

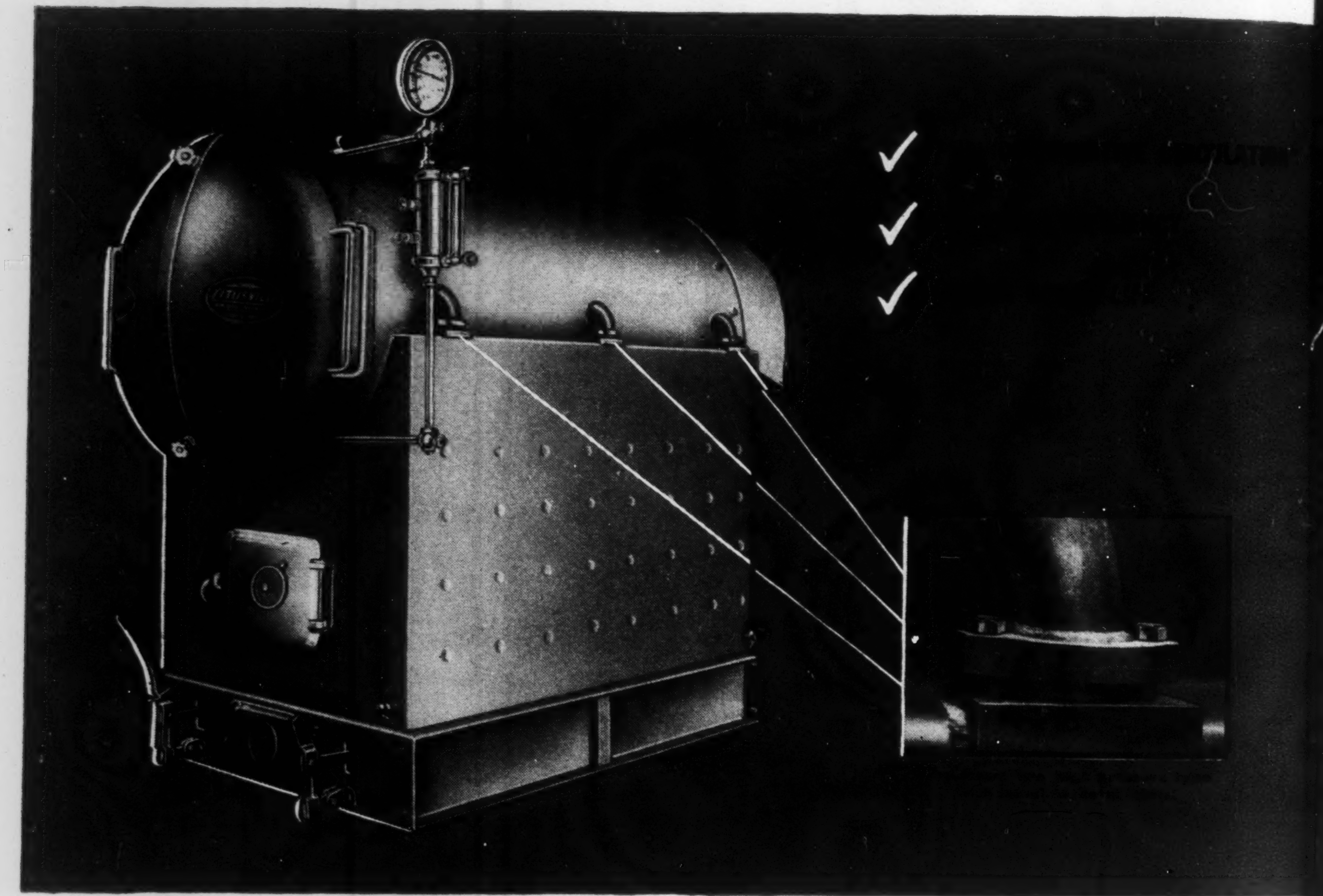
Attn. of Mr..........................

**HEAR THE BOSTON SYMPHONY:** *Saturday, American Broadcasting Co.*

# TITUSVILLE

MODERN IMPROVED *Compact*

# STEEL HEATING BOILERS



**19 STANDARD SIZES IN HAND OR MECHANICAL FIRED**

Just as a pump on a forced hot water heating job steps up circulation and increases heating results, the *Side Circulators* in Titusville Compact Boilers assure *positive circulation.*

Titusville *Side Circulators* do the work of a pump—they restrict the openings between the firebox and shell and increase the velocity of the flow of steam and hot water within the boiler.

As a result, steam bubbles that accumulate on and insulate the heating surfaces are continuously washed off and a greater amount of heat is absorbed by the water in the boiler.

New Titusville Compact Boiler Bulletin on request.

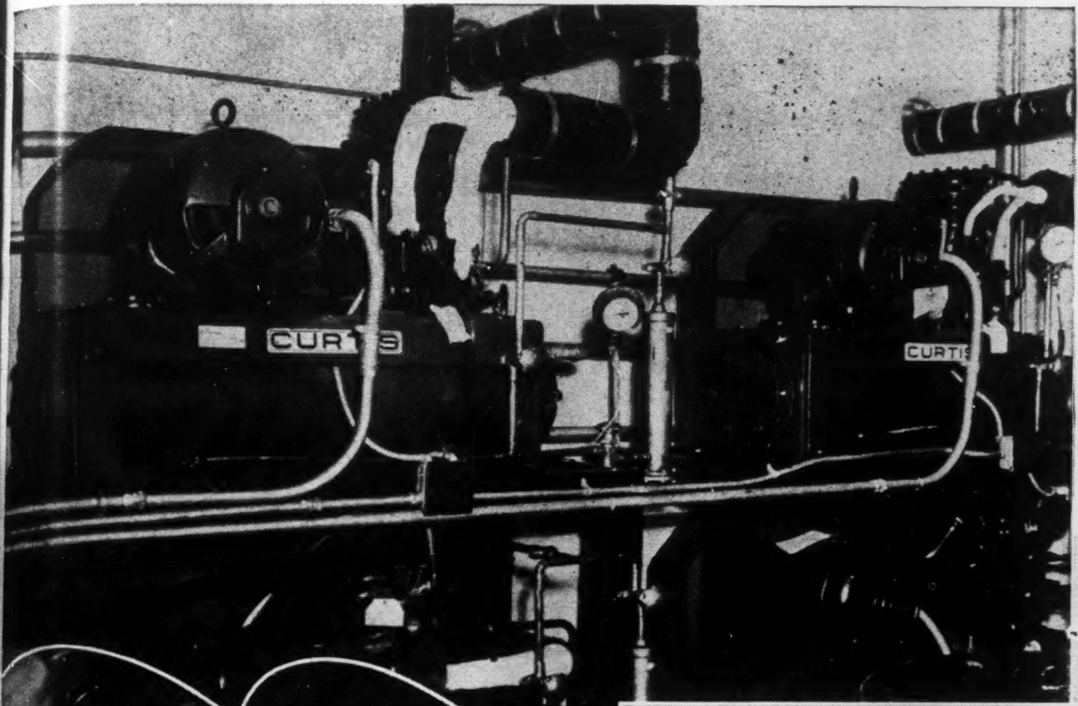
TITUSVILLE
IRON WORKS CO
TITUSVILLE, PA.

**THE TITUSVILLE IRON WORKS COMPANY**

*Division of Struthers Wells Corporation*

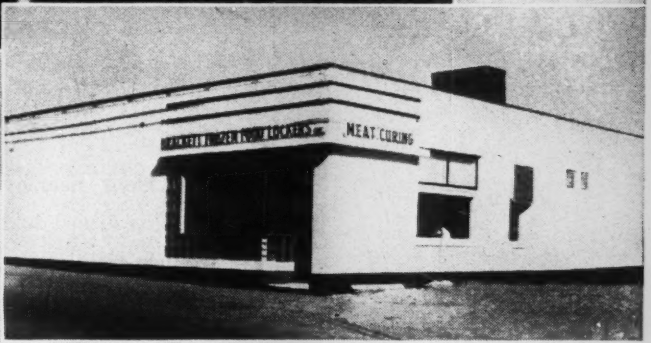
**TITUSVILLE, PA.**

**District Representatives in Principal Cities**



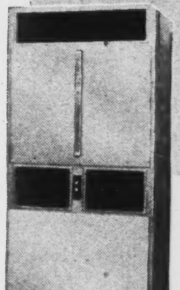
*At Left: A part of the Curtis Compressor equipment serving the refrigerating requirements of the plant.*

*Below: Exterior of locker plant — 830 lockers.*



# CURTIS
## REFRIGERATION
## -Is the Heart
## of This Efficient LOCKER PLANT

Refrigeration dealers can not only profit by constructing new locker plants, but there is profit to be gained in rebuilding and modernizing plants that are not adequately refrigerated or insulated. In many locker plants throughout the country, CURTIS Refrigerating Units are proving the answer to the demand for dependable, efficient, trouble-free performance throughout an exceptionally long machine life.



*3 and 5-ton Packaged-Type Air Conditioner.*

*Ask about Curtis Air-Conditioning Equipment, too.*

SELL Locker Plant Efficiency

WRITE FOR COMPLETE STORY ON THIS UP-TO-DATE
CURTIS-EQUIPPED LOCKER PLANT

***Bulletin RX-3 will be mailed on request***

**CURTIS REFRIGERATING MACHINE DIVISION**
***of Curtis Manufacturing Company***
1950 Kienlen Avenue • St. Louis 20, Missouri

**CURTIS**
**REFRIGERATION**
AIR CONDITIONING
AND COMMERCIAL

B-456

**FOR VICTORY BUY MORE WAR BONDS AND STAMPS**

# WHAT'S THE MARKET PRICE OF FILTERED AIR?..

Here's an inside tip on Filtered Air and Dust-Stop* preferred. When Dust-Stops are in the heating and air conditioning systems it's a good indication that there will be continual profit taking by the user.

### Low Initial Cost

Heating and Ventilating Engineers recommend Dust-Stops and the complete ready-to-assemble steel frames as a sound investment.

Ready adaptability to any system, regardless of the C.F.M. requirements, flexibility of installation, easy access to filters and the low cost of this part of the system are but a few of the reasons for the widespread preference for these replacement-type air filters.

### Safe Investment

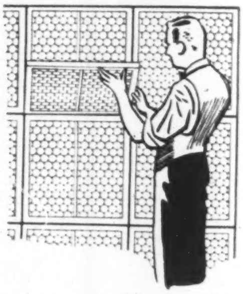
Dust-Stop Air Filters are highly efficient—are readily available, at low cost from near-by suppliers. Both initial cost and upkeep are low. Maintenance requires a minimum of man power and time.

### Keeps Paying Dividends

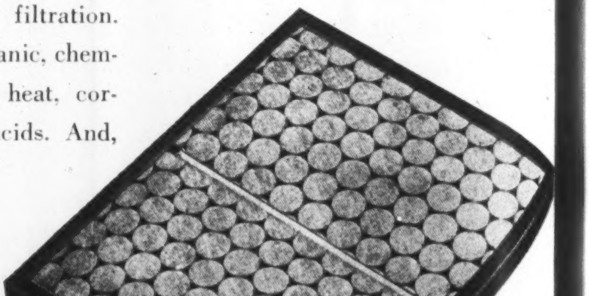
Dust-Stop Air Filters are constructed of packs of glass fibers (Fiberglas*) coated with an adhesive, faced with metal grilles and bound on the edges with a fiberboard frame.

The Fiberglas fibers, packed to proper density, form an exceptionally effective medium for air filtration. Being glass, they are inorganic, chemically stable, resistant to heat, corrosive vapors and most acids. And, being glass, they do not absorb the nonodorous, nonevaporating adhesive with which they are coated. Each impinged particle of dust is quickly soaked, acting as a wick to carry adhesive to other particles. Thus, the adhesive remains effective until the filter is so heavily loaded with dust that resistance to air flow calls for replacement.

For complete information and typical Dust-Stop installation details, see Sweet's Files or write: *Owens-Corning Fiberglas Corporation, 1911 Nicholas Building, Toledo 1, Ohio.*



*In Canada, Fiberglas Canada Ltd., Oshawa, Ont.*



**DUSTOP AIR FILTERS**

*T. M. REG. U. S. PAT. OFF.

—a FIBERGLAS product

# "He is not for an age, but for all time"

WHAT Bacon said of Shakespeare fits Sam. Since the day we bumped into him, Sam has been ageless and tireless in his efforts for you and for us. This is because he has always been enlisted in a sound cause. Sam crystalizes an idea that has teeth in it—the worthy idea of protecting every steam boiler from low water damage. Pre-war, in-war, or postwar, you can't get away from the "Sam-you-better-scram" idea!

Before the war the idea was going big. During the war it was given highest confirmation by adoption in every branch of the service. And now Sam is re-enlisted in the great era just dawning. The McDonnell Boiler Water Feeders and Low Water Cut-offs he champions can make still more dollars for you in the days ahead.

Can we keep up with Sam? You *would* bring that most embarrassing question up, but since it keeps coming up the answer is that we'll keep up as soon as we catch up, and it won't be too long until we're back on our good old program of same-day shipments.

So put the Sam-you-better-scram idea to work. Products covering a wide range of needs are briefly described opposite. Ask for new condensed catalog and price list if you haven't received latest data.

McDONNELL & MILLER, *Inc.*, 1316 Wrigley Bldg., Chicago 11, Ill.

*Doing One* M&M SAFETY CONTROLS *Thing Well*
REG. U. S. PAT. OFF.

**No. 47-2 Feeder-Cut-off Combination for boilers below 5000 sq. ft.; maximum steam pressure, 25 lbs. Quick-Hook-Up for speedy, correct installation.**

**No. 51-2 Feeder-Cut-off Combination. Functions same as 47-2, but for boilers larger than 5000 sq. ft.; maximum steam pressure, 35 lbs.**

**No. 67 Low Water Cut-off for all automatically fired boilers; maximum steam pressure, 25 lbs.**

**No. [illegible] Level Control for boilers of any size with steam pressures up to 150 lbs. Used as feed-pump controls, low [illegible] alarms, or any [illegible]**

# McDONNELL

*Boiler-Water Level Controls*